TENNESSEE CREEK PROJECT
BIOLOGICAL ASSESSMENT
WILDLIFE

LEADVILLE RANGER DISTRICT
SAN ISABEL NATIONAL FOREST
LAKE COUNTY, COLORADO

MARCH 14, 2014

U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE

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1.0 INTRODUCTION

1.1 Purpose of this Biological Assessment

This biological assessment (BA) analyzes the potential effects of the Tennessee Creek Project on the San Isabel National Forest and White River National Forest on federally listed threatened, endangered, candidate wildlife species, and critical habitats, pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (ESA). Potential effects of the project and associated forest management activities are analyzed. ***Plants and fish species are addressed in separate analysis reports.*** Species meeting the following criteria are addressed in this assessment:

1. known to occur on the Forest based on confirmed sightings;
2. may occur on the Forest based on unconfirmed sightings;
3. potential habitat exists for the species on the Forest; or
4. potential effects may occur to these species

1.2 Current Management Direction

Current management direction for federally proposed, threatened and endangered species on the Districts of the Forest can be found in the following documents, filed at each district office:

- Forest Service Manual and Handbooks (FSM/FSH 2670)
- National Forest Management Act (NFMA)
- Endangered Species Act of 1973, as amended (ESA or Act)
- Migratory Bird Treaty Act (MBTA)
- National Environmental Policy Act (NEPA)
- Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands (PSICC) Land Resource Management Plan (LRMP) (U. S. Forest Service 1984)
- White River National Forest Land and Resource Management Plan (WRNF LRMP)
- Species-specific Recovery Plans which establish population goals for recovery
- Species management plans
- Species management guides or conservation strategies
- Regional Forester policy and management direction
- Lynx Conservation Assessment and Strategy (LCAS) (Ruediger 2000)
- Southern Rockies Lynx Amendment (U. S. Forest Service 2008)
- Implementation Guide – Southern Rockies Lynx Amendment (U.S. Fish and Wildlife Service and U.S. Forest Service 2009)

1.2.1 Land and Resource Management Plan Direction

The LRMPs for the San Isabel and White River NFs provides management guidelines, which incorporate regional direction for each species addressed in this assessment. The Management Areas (MA) included in this project that pertain to threatened, endangered, and sensitive (TES) species addressed in this assessment are:

PSICC LRMP

- MA 4B Emphasis is on habitat for management indicator species (Forest Plan, pgs. III – 134 thru III – 143)
- MA 5B Emphasis on big game winter range (Forest Plan, pgs. III – 149 thru III – 160)

WRNF LRMP

The portion of White River NF management area inside the Tenenssee Creek Project boundary is not speciefic to any TES or management indicator species (MIS) and is based around the existing ski area, Ski Cooper. (MA 8.25 Emphasis on Ski Resort).

2.0 CONSULTATION HISTORY WITH U.S. FISH AND WILDLIFE SERVICE

The project area was visited by Leslie Elwood, USFWS biologist, during a field trip on October 4, 2011 to discuss lynx habitat management, snowshoe hare winter foraging habitat, lynx horizontal cover, the lynx habitat re-mapping process and the Tennessee Creek project. Follow up phone conversations regarding the project and clarification of implementation and compliance of standards outlined in the Southern Rockies Lynx Amendment (SRLA) took place on December 12, 2012, February 6, April 23, May 5, May 22, and July 25, 2013.

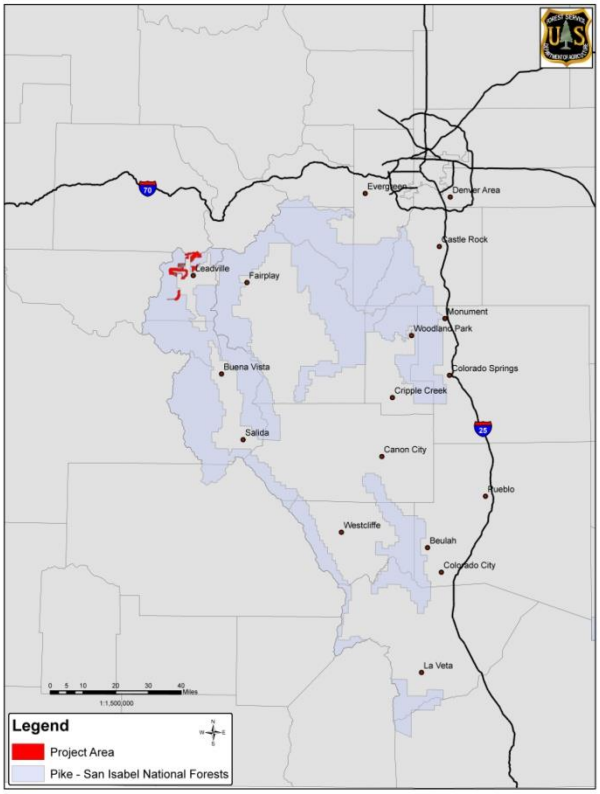
Need for Re-Assessment Based on Changed Conditions

This BA and findings above are based on the best current data and scientific information available. A new analysis and revised BA must be prepared if one or more of the following occurs: (1) new species information (including but not limited to a newly discovered activity area or other species information) reveals effects to threatened, endangered, proposed species, or designated/proposed critical habitat in a manner or to an extent not considered in this assessment; (2) the action is subsequently modified or it is not fully implemented as described herein which causes an effect that was not considered in this assessment; or (3) a new species is listed or critical habitat is designated which may be affected by the action that was not previously analyzed herein.

3.0 PROJECT AREA DESCRIPTION, LOCATION, AND MAP

The Tennessee Creek project encompasses approximately 15,930 acres located in Lake County, Colorado near the town of Leadville on the San Isabel National Forest. An additional 520 acres occurring on the White River National Forest, Eagle-Holy Cross Ranger District that are incorporated in the Ski Cooper boundary are also included in the extreme northern end of this proposal for a total of approximately 16,450 acres. Elevations in the area range from 9,600 feet (ft.) to over 11,800 ft. (See Map 1 below).

Map 1. Tennessee Creek Project Vicinity Map



For this analysis, the action area is defined as within ½ mile of the proposed management action boundary for all species except for the Canada lynx (*Lynx canadensis*) and North American wolverine (*Gulo gulo luscus*). Canada lynx will be analyzed at the Lynx Analysis Unit (LAU) scale (Tennessee Pass and Massive LAUs) which have been identified for this species by the Forest Service (U.S. Forest Service 2013) and wolverine will be analyzed at the district scale. The project is broken into several non-contiguous areas including: Tennessee Pass, Mt Zion, Turquoise Lake, and Halfmoon Creek (See Map 2 below). Major vegetation types within the project area include lodgepole pine (*Pinus contorta*), subalpine fir (*Abies lasiocarpa*), and Engelmann spruce (*Picea engelmannii*). There are also minor amounts of Douglas-fir (*Pseudotsuga menziesii*), blue spruce (*Picea pungens*), bristlecone pine (*Pinus aristata*), aspen (*Populus tremuloides*), grasslands, willow, various forbs, grasses and sedges, as well as rocky areas and open water (see Table 1 below).

Legal description: T8S, T9S, and T10S, R79W, R80W and R81W (the project area is within these township and ranges but does not cover all of the sections, please see Map 2 for details).

Map 2. Project boundary (red) split into four different locations: Tennessee Pass (Ski Cooper), Mt. Zion, Turquoise Lake, and Halfmoon Creek.

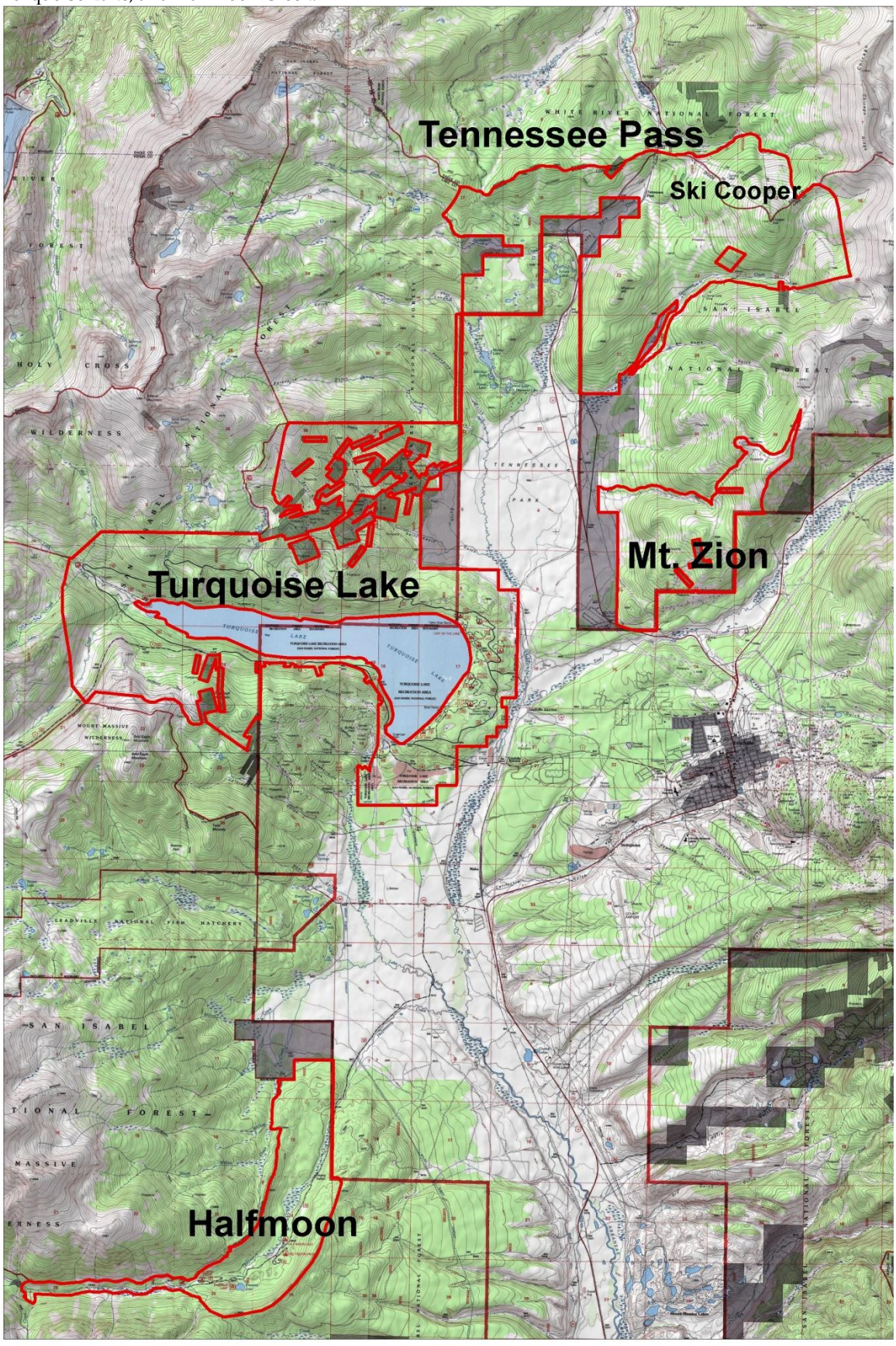


Table 1. Amount of each vegetation/habitat type by acres within the project area that are "treatable". (Source: PSICC common vegetation unit [CVU] database for National Forest lands).

Group Name	Cover Types	Group Acres
Lodgepole pine	Lodgepole pine	9,480
Spruce-fir	Spruce-fir Douglas-fir Bristlecone pine Blue Spruce	1,550
Other Vegetation	Grass Forbs Fescue Willow Alder Sage	2,095
Aspen	Aspen	455
TOTAL Treatable Acres*		**13,580**

***"Treatable" acres consist of all acres within the project area excluding those acres that are inaccessible due to slope or access reasons**.

A large portion of the Tennessee Creek project area consists of stands of mature lodgepole pine that is approximately 125 to 150 years old. Essentially these entire forests were cut during the late 1800's and early 1900s to support the needs of a booming mining industry in the region. Monocultures of lodgepole pine subsequently regenerated with little species or age diversity in much of the project area. The small amounts of spruce-fir species present have been suppressed by lodgepole pine further reducing species diversity.

4.0 PROPOSED ACTION AND ALTERNATIVES CONSIDERED

Three alternatives were developed in detail for this environmental analysis process. The alternatives described and studied in detail are:

4.1 No Action Alternative

The No Action Alternative addresses the present actions that are occurring within the project area. Listed below is a representation of the present actions taking place in the Tennessee Creek project area; it is not intended to be all inclusive of present management activities.

- Within the footprint of the campgrounds/developed sites at Halfmoon Creek and Turquoise Lake, vegetation management (thinning, group selection, patch cuts, and chipping of slash) would continue. Annual treatments average 7 – 10 acres per year.
- Hazard tree removal at developed sites, Ski Cooper and along system trails and roads would continue as needed.
- Northwest Leadville Hazardous Fuels Project (ongoing vegetation management project) continues on a limited scope. Treatments would include pre-commercial thinning, thinning of mature stands, and pile burning. Annual treatments average 10 – 20 acres per year for the next 3 years.

- Using Forest Plan Direction, continue to improve / rehabilitate the area adjacent to Halfmoon Creek (within 100 feet of the creek). Treatments include using boulders and buck & rail fence to restrict access and seeding to re-vegetate areas.
- Non-system route rehabilitation.
- Noxious weed monitoring and treatments.
- Regular maintenance of system trails and roads.
- Recreation activities would continue as authorized including snowmobiling, Nordic and alpine skiing, off-highway vehicle (OHV) use, biking and hiking etc.
- Outfitter and guide activities and other special events.

4.2 Alternative 1 (Proposed Action)
In addition to the previously stated ongoing actions listed in section *4.1 No Action Alternative*, the following actions are proposed.

The Leadville Ranger District of the San Isabel National Forest proposes to implement an approximately 16,450 acre vegetation and watershed improvement project (the Tennessee Creek Project) over the next 10 years. The focus of this project is aimed at creating age class and species tree diversity by creating or augmenting existing openings on the landscape and thinning forested areas to varying degrees through mechanical and prescribe fire burning techniques. In addition to vegetation harvest treatments the following actions are being proposed as well: limited tree planting inside the Ski Cooper boundary, improving aquatic organism passageways (AOPs), closing and rehabilitating non-system route and dispersed camping sites where riparian areas are being negatively impacted, rehabilitating areas with erosion and compaction issues at some designated campgrounds, creating snags for wildlife habitat, installing a nesting platform for raptors (i.e., osprey, bald eagles) along Turquoise Lake, and restoring and improving stream habitat in the Halfmoon Creek drainage. These actions are discussed in more detail below.

"Treatable" acres consist of all acres within the project area excluding those in areas and acres that are inaccessible due to slope or access reasons. Because of these limitations, about 13,580 acres out of the entire 16,450 project area acres will actually be "treatable". Harvest treatments could take place year round using hand tools (chainsaws) and large machinery (dozers, log trucks, skidders, etc.) and those tools appropriate for implementing prescribed burns (engines, drip torches, chainsaws, etc.). Though it is extremely unlikely, operations could commence during the night hours. Conventional ground-based logging systems would be used to remove logs from areas that are accessible using existing National Forest System Roads, non-system routes, or constructed temporary roads. Approximately 21 miles of temporary roads would be needed to access treatment areas. On constructed temporary roads and non-system routes, access would be restricted to authorized personnel only. Authorized personnel include Forest Service personnel, contractors and permittees (i.e. individuals who have a valid fuelwood permit). Access would be restricted through the use of gates, barricades or other means as appropriate. Temporary roads would be closed by the most appropriate means necessary (ripping, bouldering, gating etc.) when all treatments, including prescribed burning, are complete.

TREATMENTS IN LODGEPOLE PINE
<u>Openings</u>
The main species targeted for treatment within the project area is lodgepole pine with smaller amounts of treatments in aspen (See Table 2 below). Treatments that result in

openings would take place on a maximum of 25% (approximately 2,370 acres) of the total acres of *treatable* lodgepole pine within the project area. Again, "treatable" acres within the project area are defined by those acres that are not limited by slope, accessibility, rocky substrates etc. Openings created mechanically would be limited to 40 acres or less in size whereas prescribed burn treatment units could exceed 40 acres and could include mechanically treated as well as untreated areas. In mapped lynx habitat, stands with high levels (35% or greater) of dense horizontal cover (DHC) would be retained for snowshoe hare foraging. These high quality stands would be identified and marked appropriately by personnel trained to measure horizontal cover with coverboards (a wildlife biologist or forester and/or crew that has been trained by the biologist). These areas would be identified on the ground and excluded from treatment. Stands that have obviously high horizontal cover as well as those with very low horizontal cover would not need to be measured as exclusion or inclusion in treatments would be obvious. Slash left on-site may be lopped and scattered, piled and burned, broadcast burned, crushed with yarding and harvesting equipment, or disposed of by other means. Reserve areas would be left on the landscape as refuge for wildlife species. The placement of these reserves in relation to treatment areas would be tailored to each individual treatment area and would be scattered throughout the entire project area. Reserve areas would consist of stands with greater than 35 percent dense horizontal cover, steep areas, inaccessible areas, and wet areas. In addition to this approximately 10 percent of the areas identified for thinning would be left as reserve areas. There would be at least 200 feet distance between adjacent openings to provide secure travel corridors for wildlife. Thinning and prescribed fire treatments may occur within some of the corridors, while others would remain untreated. Old growth and areas with closed canopy with substantial quantities of coarse woody debris could be targeted and incorporated into reserve areas between treatments and could be focused around middens to protect squirrel habitat.

<u>Thinning</u>

The other 75% of the lodgepole pine acres (approximately 7,110 acres) within the treated area would be thinned to varying degrees. Again, stands with >35% DHC would be identified (by trained personnel) and excluded from treatment in order to preserve quality lynx habitat. The following guidance and constraints would be used in treating lodgepole pine on all remaining acres outside of the openings (approximately 7,110 acres are identified for thinning):

1. In lodgepole pine stands, reduce basal area to an average of 80 – 120 square feet per acre. Overall, basal area may differ substantially from one point to another. Some areas may require multiple treatments in order to achieve the basal area goal, without causing blowdown concerns within the stand.
2. Preference would be given to retaining other species (spruce, fir, aspen) over lodgepole pine. The spacing would be variable.
3. Trees would be thinned in a manner to create clumps or cohorts of trees intermingled with small, irregular openings or areas of lower tree density. Pockets of dwarf mistletoe-infected trees and lodgepole interspersed with aspen would be targeted for removal to create openings and provide for species diversity.
4. Slash left on-site would be generally lopped and scattered, piled and burned, or disposed of by other means. Broadcast burning may take place in 25 – 50 percent of thinned areas (up to 3,555 acres).
5. Opportunities for firewood gathering by the public would be provided.

6. Pre-commercial thinning of currently young lodgepole pine stands may take place on approximately 345 acres of the 7,110 thinning acres of lodgepole pine.
7. Prescribed fire could be used in most areas that have been treated mechanically or by hand, or it could be used as a treatment by itself. The exact burn treatment to be used and their locations would be determined after mechanical vegetation treatments are completed, and would depend on the level of natural and activity fuels in each stand, slope, soil type, and other related factors.

TREATMENTS IN ASPEN

In addition to creating openings and thinnings within lodgepole pine stands, 25% of treatable aspen (acres not limited by slope, accessibility etc.) within the project area would be harvested. This would result in approximately 115 acres of aspen, out of 455 treatable aspen acres, that would have openings created in them. The methods of implementation and burning criteria stated above for lodgepole pine apply here as well.

TREATMENTS IN SAGEBRUSH AND MEADOWS

Treatments for both meadows and sagebrush would include the removal of encroaching conifer trees. Prescribed burn treatments would only be used in meadows in order to stimulate grass/forb production while preserving sagebrush communities. Because sagebrush can take decades to return after a fire, no prescribed burns will take place where sagebrush is present.

TREATMENTS IN SPRUCE/FIR

In the transition area between lodgepole pine and spruce/fir where the understory is underdeveloped, the objective of vegetation management would be to remove mature lodgepole pine to promote regeneration. These areas would receive "un-even" aged management treatments (patch cuts and single tree selection) to maintain or promote horizontal diversity within the stand. Individual treatment units would be between 0.1 and 5 acres. Areas that contain both substantial amounts of down, woody debris and high (35% or greater) horizontal cover would be retained and not impacted directly.

Only in the event that spruce beetle or other insects and diseases impact spruce forests, would the following treatments in spruce be allowed: salvage of dead trees, removal of trees infested with beetles, and removal of green trees for skid trails, temporary roads or where trees will blow over. There would be no green trees harvested in spruce/fir except for in the skid trails or temp roads in order to access the dead trees. Currently, there is very limited spruce/fir areas within the project area that are being impacted by insect or disease; this salvage treatment proposal would only be implemented should the need arise in the future. The entire 16,450 acre project area includes approximately 1,550 acres of spruce. Up to 90% (1,395 acres) of the spruce/fir would be salvaged if insects and/or disease kill these stands; 10% would be left for lynx denning habitat. These reserve areas would be identified by and coordinated with the wildlife biologist to ensure the best possible denning habitat is retained (areas near high quality foraging habitat, stands on north or east aspects etc.). Where appropriate, pile burning would be used to treat slash. Broadcast burning would not take place in spruce/fir stands.

<u>Ski Cooper Boundary Only</u>

Only inside the Ski Cooper boundary would green tree harvest take place in spruce/fir stands consisting of group and individual tree selection treatments and would be designed to develop multi-aged, multi-storied stands. In addition, where multiple

species occur, treatments will be designed that attempt to maintain or increase the number of species present within any particular stand. Where appropriate, pile burning would be used to treat slash. Broadcast burning would not take place in spruce/fir stands.

The table below summarizes all acres of treatment within the project area for Alternative 1. It should be noted that the 1,395 acres of spruce/fir that would be treated should a spruce beetle epidemic arise, could actually be any combination of clear-cuts and thinnings, but it is not predictable at this time. These 1,395 acres would be the maximum amount salvaged (if all spruce/fir within the project area was killed including all spruce/fir inside the Ski Cooper boundary) but likely would be less. If insect and disease ***does not*** impact the spruce/fir forests, the only treatment in spruce/fir stands would be inside the Ski Cooper boundary. There are approximately 300 acres of spruce/fir habitat inside the Ski Cooper boundary. The green tree harvest inside the ski area boundary would consist of group and individual tree selection and treatments would be designed to develop multi-aged, multi-storied stands.

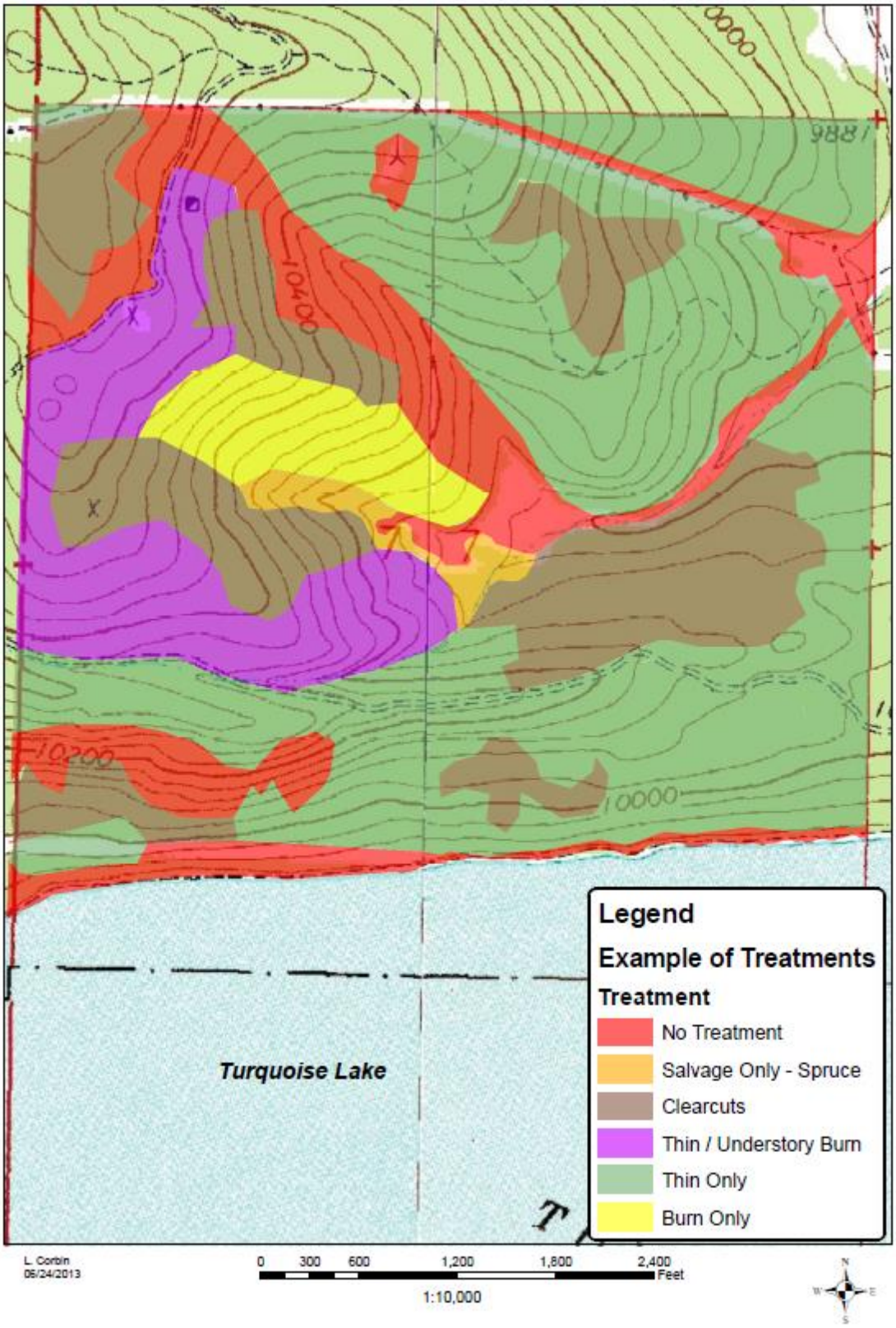
Table 2. Maximum acre harvest summary for Alternative 1.

TYPE	Total treatable acres	% treating	Remaining treatable acres	Clear Cuts Project Area	Thinning Project Area (precommercial included)	Clear Cuts Tenn Pass LAU	Thinning Tenn Pass LAU	Clear Cuts Massive LAU	Thinning Massive LAU
Lodgepole	9,480	100	9,480	2,370	7,110 (345)	1,100	3,300 (40)	1,270	3,810 (305)
Aspen	455	25	115	115	0	58	0	57	0
Spruce/Fir	1,550	90	1,395	0	1,395	0	780	0	615
TOTAL PROJECT	13,580	96	10,990	2,485	8,505 (345)	1,158	4,080 (40)	1,327	4,425 (305)

The timeline for implementation is stretched out over the next 10 years and treatment locations would be scattered throughout the entire project area. Meaning, all the clear cuts would not be implemented all in one location, all at the same time; rather scattered throughout the 16,450 acre project area over a 10 year time period.

Because exact treatment areas are not predetermined, an example map of what treatments would look like on the ground has been created and is shown below. This is not necessarily what would be implemented on this piece of land; rather this is to show how clear cuts, thinnings, and reserve areas would interplay between one another.

Map 3. Example of treatments in the Tennessee Creek Project area.



OTHER ACTIONS

Planting tree islands within runs inside the Ski Cooper boundary would be encouraged. Cones would be collected from local sources, germinated at a Forest Service nursery and would be available for use in establishing young islands of trees within existing runs.

Ski Cooper, in coordination with the Forest Service, could determine the best placement of these groups. However, it is suggested that they be placed below existing tree islands, where appropriate, to help provide seedlings with protection from skiers while they develop.

To improve aquatic organism passage, culverts that prevent movement of aquatic organisms would be reinstalled, removed or replaced with an appropriately sized and type of conveyance (standard culvert, bottomless arch culvert, etc.). Heavy equipment would be used and the appropriate permits would be obtained from the U.S. Army Corps of Engineers. Boulders, trees, and other native materials may also be used during installation or to rehabilitate the area.

To protect and improve riparian ecosystems, non-system routes and dispersed campsites that are near or go through riparian areas may be closed. Treatments include ripping, seeding, bouldering, fencing or other methods that would restrict access. Heavy equipment may be used.

To improve erosion and compaction issues at designated camp sites (campgrounds), identified areas would be ripped (breaking up compaction), contoured, mulched, seeded, and/or have erosion control netting installed as needed. Both hand and mechanical treatments may be utilized.

Snags would be created for cavity-dependent wildlife (birds, bats, etc.) in areas where minimum snag requirements are lacking. Trees would be killed through girdling, fire, or other methods to create snags for cavity-dependent species.

Nesting platforms may be constructed and placed along the shoreline of Turquoise Lake to provide additional nesting opportunities for raptors (i.e. osprey, bald eagles). To create the nesting platforms, trees may be topped or poles installed in specified locations. Heavy equipment would be used to place platforms and would coincide with an ongoing vegetation project in the same area to minimize any additional disturbance of heavy equipment use.

Utilize natural river restoration techniques to improve sediment transport and aquatic habitat on Halfmoon Creek from the confluence of Elbert Creek and Halfmoon Creek downstream to the U. S. Geological Service gaging station on Halfmoon Creek. The restoration effort would utilize granitic boulders, whole trees, and other native materials to mimic natural stream features, and may include full channel spanning cross vanes, J-hook vanes, habitat trees, and micro vortex in channel features. Bank full riparian benching and stream bank toe slope stabilization would be accomplished utilizing toe wood, full length trees, transplanted willow and sedge. Also within the Halfmoon drainage, a degraded road-water crossing upstream of the confluence of South Halfmoon Creek and Halfmoon Creek would be stabilized. The crossing has over-widened over time and requires stabilization to reduce sedimentation input from the road and to improve aquatic organism passage through the crossing. Natural river design treatments would be applied here as well. Heavy equipment would be used for the project. Boulders, trees, and other native materials may be used for stabilization and restoration. Additional engineered plans and appropriate site visits by specialists and recommendations for each resource would be attained before any re-construction would take place.

Forest Service system road (FSR) 109, the Mt. Zion road, could require substantial maintenance in order to accommodate the size and load requirements of logging traffic. This road currently has a sharp corner section that could need to be modified for larger log trucks but overall mileage of the road would not change. There could be up to one acre of disturbance to accomplish this modification. Should this road require substantial maintenance, engineered plans, specialist site visits and further design criteria recommendations (if deemed necessary) would be provided. Other roads within the project boundary may also require basic maintenance such as: culvert cleaning or replacement, water bar or rolling dip reshaping where needed.

4.3 Alternative 2

In addition to the previously stated ongoing actions listed in section *4.1 No Action Alternative*, the following actions are proposed.

Alternative 2 for the Tennessse Creek Project is very similar to Alternative 1 (the proposed action). The percentage of treatable acres of lodgepole that are designated as openings verus thinnings is different. Treatments that resulted in creating or augmenting existing openings in lodgepole pine would not exceed 40% of treatable lodgepole acres (3,790 acres) compared to 25% treatment (2,370 acres) in Alternative 1. The acres of thinning forested areas is also different. For Alternative 2, the acres of thinning would be substantialy less than those for alternative 1 (7,110 acres); approximately 3,030 acres would be thinned and treatment areas would be concentrated around areas adjacent to Turquoise Lake, ditches associated with water rights, and areas within the wildland urban interface.

The acres of treatable aspen that would be designated for openings would also increase to 40% (180 acres) versus the 25% (115 acres) proposed in Alternative 1. The spruce/fir components would be the same. Table 3 below summarizes species specific proposed acres for Alternative 2 and Table 4 compares totals acres treated between both alternatives.

Table 3 . Acre harvest summary for Alternative 2.

TYPE	Total treatable acres	% treating	Remaining treatable acres	Clear Cuts Project Area	Thinning Project Area (precommercial included)	Clear Cuts Tenn Pass LAU	Thinning Tenn Pass LAU	Clear Cuts Massive LAU	Thinning Massive LAU
Lodgepole	9,480	72	6,820	3,790	3,030 (345)	1,760	780 (40)	2,030	2,250 (305)
Aspen	455	40	180	180	0	90	0	90	0
Spruce/Fir	1,550	90	1,395	0	1,395	0	780	0	615
TOTAL PROJECT	11,485	73	8,395	3,970	4,425(345)	1,850	1,560 (40)	2,120	2,865 (305)

Table 4. Comparison of total acres treated in Alternative 1 (proposed action) and Alternative 2

	Alternative 1 (Proposed Action)	Alternative 2	Acre Difference
Total Acres Treated	11,060	8,395	-2,665
Acres Clear Cut	2,485	3,970	+1,485
Acres Thinned	8,505	4,425	-4,080

All other proposed activities in Alternative 2 are the same as those proposed for Alternative 1 (erosion control at campgrounds, stream restoration etc.)

5.0 PROJECT DESIGN CRITERIA

The following design criteria are part of the proposed action and would be incorporated should the proposal be approved. These criteria are common to both Alternatives 1 and 2 and are those pertinent to wildlife species or their habitat only. For a complete list of design criteria, see the *Environmental Assessment for The Tennessee Creek Project* (U.S. Forest Service 2013) on file at the Leadville District office.

1. All new nesting/denning sites for threatened, endangered, or Forest Service sensitive species observed prior to or during implementation will be reported immediately to the Wildlife Biologist and appropriate protection measures will be implemented.

SNAGS AND COARSE WOODY DEBRIS
Snags and recruitment snags are to provide for nesting, roosting, and foraging habitat for small mammals and birds such as bats, woodpeckers, owls, songbirds, etc. and for future and current denning habitat for lynx. (These criteria do not apply to fuel breaks if they would compromise the integrity of the fuel break).

2. Maintain a ***minimum*** of 80 snags per 10 acre average of varying and large diameter size class. Guidelines for snags include:
    a. Retain all soft snags (class 3, 4, and 5) except for safety hazards (Forest Plan, pg. III – 12) to the greatest extent reasonable and practical.
    b. Retain all hard snags (when they are present) in the largest size class available (pre-treatment) to meet the above targets.

    If above existing snag levels are not available, provide for green recruitment snag trees sufficient to bring snag/recruitment snag levels up to the above mentioned target levels in a well distributed manner of both clumps and individual trees, of largest available trees. Trees with defects (e.g. "wolfy" appearance, dead tops, forked tops, cankers, heartrot, diseases, broken tops, and large limbs) would be selected when possible. *Where practical*, create new snags by girdling, burn plan design, or other means, as necessary to achieve target numbers of snags. Clumping (versus even spacing) of snags and recruitment trees is preferable if desired snag species and larger dbh snags are available for the snag retention clump. Locate snag patches adjacent to green trees to provide additional cover for wildlife species.

3. Assure that adequate coarse woody debris (CWD) is retained for wildlife use and nutrient recycling following mechanical and prescribed fire treatments by retaining an average of at least 200 linear feet of the largest diameter wood available per acre where feasible. In areas where the prescription includes pile burning, some piles would be left in each treatment area for wildlife habitat and to supplement a stand deficient in CWD.
4. The snag and CWD requirements should be retained through all treatment phases (commercial operations, fuelwood, and prescribed fire) with the realization that some existing snags may become CWD, retention trees may become snags, and CWD may be unintentionally consumed during implementation (due to wind throw, fire, etc.)
5. Do not cut any trees that have evidence of being used as a nest tree or other important wildlife use (i.e., presence of constructed, natural or excavated nesting cavities, fecal whitewash, feathers, bolus pellets, skeletal bones, squirrel middens, or fur of prey species present at or around the base of a tree).
6. In general, no treatments are allowed in the water influence zone (WIZ) and these riparian areas, including kettles, will be buffered 100 feet on each side of the WIZ. A site visit by the hydrologist, fisheries or wildlife biologist may allow flexibility in this criteria if it is determined a smaller buffer may be appropriate. Prescribed fire may occur in the WIZ, but direct ignition will not occur in these zones. Pile burning is not allowed in the WIZ.
7. To reduce risk of spreading noxious weeds, heavy equipment and vehicles will be cleaned and inspected prior to entering the project area and all mud, dirt, and plant parts will be removed according to Region 2, *Guide to Noxious Weed Prevention Practices*.
8. Treatment areas will be monitored pre- and post-treatment (two years post-project completion) for noxious weeds. Weed locations identified will be scheduled for treatment by the Noxious Weed Coordinator.
9. Temporary roads will generally be closed within 5 years after the mechanical work has been completed. This will allow prescribed fire treatments (broadcast burning) to be completed prior to the road closures.
10. In forested areas, a 200 foot deer and elk hiding cover buffer will be maintained along 75% or more of each side of roadways to discourage and minimize the likelihood of unauthorized off-road vehicle (OHV) use and to maintain adequate visual screening for wildlife. (Forest Plan, pg. III – 153). Topography can provide hiding cover and would provide some flexibility in these design criteria (where road cuts prohibit vehicle occupants from seeing 200 ft. from the road).
11. To protect big game (mule deer and elk) critical winter range, winter range, and winter concentration areas seasonal restrictions for timber harvest and associated activities will be implemented on winter range within the project area from December 1 through April 15. Prescribed burning activities may be acceptable during this time period and will be coordinated with the Wildlife Biologist.
12. If conflicts with other species protection measures prohibit effectively operating during the summer months in an area (restrictions for raptor nest sites, etc.), timber harvest operations may take place on winter range during the restriction period IF *both* of the following criteria are met:
    a. A locked gate will be placed at the entrance to temporary roads used to access a treatment area to prohibit all motor vehicle access (except for authorized administrative use – FS personnel and timber contractors).

b. Only 20% of the mapped winter range will be operated on during the restriction dates to allow big game to utilize the other 80% during this time. This would allow up to approximately 375 acres of treatment per year in big game winter range during the restriction periods.

13. Avoid disturbing elk calving and mule deer fawning concentration areas between May 15 and June 30th.

6.0 PREFIELD REVIEW

The Colorado Natural Heritage Program database (Colorado Natural Heritage Program (CNHP) 2012) and district files (U.S. Forest Service 2013b) were reviewed to identify element occurrence records within the Action Area. There have been numerous observations of Canada lynx in the past several years within the Tennessee Pass and Massive LAUs. In February and March of 2013, three lynx were trapped, collared and released all within or near the Tennessee Creek project area as part of an ongoing research project led by Liz Roberts of the White River National Forest and John Squires of the Rocky Mountain Research Station. Recent credible, but unverified reports of wolverines have been received from the several National Forest-managed lands in Colorado. Wolverines have been reported with credibility on the Leadville Ranger District. In 2006, wildlife biologist, Jeni Windorski, observed a wolverine moving in the alpine on the district but south of the project area. A collared wolverine (M56) that ventured down from Wyoming into Rocky Mountain National Park has also been tracked as far south as Leadville. There are several historical reports as well that have not been confirmed as credible or not. The project area has had limited surveys for lynx and none for wolverine so for this analysis, presence is assumed in suitable habitat where adequate surveys have not been completed.

7.0 FEDERALLY LISTED AND CANDIDATE SPECIES

An official species list from the FWS (U.S. Fish and Wildlife Service 2013) with all federally listed and proposed species within Lake and Eagle Counties in Colorado was requested and reviewed for this analysis. The Lake County list was received from the Lakewood office on April 18, 2013 (consultation tracking number 06E24000-2013-SLI-0467) and the Eagle County list was received from Grand Junction office on May 1, 2013 (consultation tracking number 06E24100-2013-SLI-0114). Please see Appendix 1 for lists. Using this list, it was determined which of those species had a potential to occur within the administrative boundaries. Species not known or with no potential of occurring on the Forest are documented with rationale in: *Threatened, Endangered, and Forest Service Sensitive Species on the Pike and San Isabel National Forests* (Wrigley 2012). A list of species known or with a potential to occur or be affected by the proposed alternatives, as shown in the table below, will be assessed. Those marked with no potential to occur will not be discussed further in this document. Excluded species have been dropped from further analysis by meeting one or more of the following conditions:

1. species does not occur nor is expected in the project area during the time period activities would occur;
2. occurs in habitats that are not present; or habitat not affected by project
3. project is outside of the geographical or elevational range of the species.

For a more detailed species account, including natural history, habitat requirements, status, and background information for each species please refer to *Threatened, Endangered, and Forest Service Sensitive Species on the Pike and San Isabel National Forest* (Wrigley 2012) which can be found on file at the District office.

7.1 Critical Habitat

There is no proposed or designated critical habitat for any federally listed or proposed species within the analysis area; therefore, there will be no direct, indirect, or cumulative effects to any critical habitat and critical habitat will not be addressed further in this assessment.

7.2 Species Considered and Evaluated

Threatened, endangered and candidate species with the potential to occur within the Analysis Area on the San Isabel National Forest (Forest) as well as on the White River National Forest are listed below in Table 5. For more species information, please refer to *Threatened, Endangered, and Forest Service Sensitive Species on the Pike and San Isabel National Forest* (Wrigley 2012). Plant and fish species are not analyzed in this document.

Table 5. Threatened, endangered, and candidate species with potential to occur within the Analysis Area.
[1]**Status Codes**: **E**=Federally listed endangered; **T**=Federally listed threatened; **C**= Federally candidate/proposed for listing
[2]**Exclusion Rationale Codes**: **ODR**=outside known distributional range of the species; **HAB**= no habitat present in Analysis Area; **ELE**= outside of elevational range of species

Species Common and Scientific Name	Status[1]	County	Potential to Occur?	Rationale for Exclusion[2]	Brief Habitat Description and Range in Colorado
INVERTEBRATES					
Uncompahgre fritillary butterfly *Boloria acrocnema*	E	Lake Eagle		HAB	known to only occur above timberline on Mt. Uncompahgre, laying eggs on snow willow (*Salix nivalis*); potentially occurring in Custer and Saguache counties.
BIRDS					
Greater sage-grouse (*Centrocercus urophasianus)*	C	Eagle		ODR	Sagebrush obligate with grass/forb understory in rolling or mountainous terrain, with water nearby in spring 4,500 to 9,000′ elevation
Mexican Spotted owl *(Stix occidentalis lucida)*	T	Eagle		HAB	Steep-sided rocky canyons or outcroppings with old-growth mixed conifer (ponderosa pine, Douglas-fir, white fir) forests possessing cool, shady microclimates; up to 9,500 ft. elevation. Critical habitat is designated by FWS.
Yellow-billed Cuckoo *(Coccyzus americanus)*	C	Eagle		ODR	Eastern subspecies; riparian forests along the Arkansas River and urban areas with tall trees; a rare to uncommon spring and fall migrant and summer resident of E Colorado and SW KS and potentially on the San Carlos RD.
MAMMALS					
Canada lynx *Lynx canadensis*	T	Lake Eagle	X		dense spruce-fir, Douglas-fir, early seral lodgepole pine, mature lodgepole pine with developing understory of spruce-fir & aspen in subalpine zone & timberline, using caves, rock crevices, banks, logs for denning, closely associated with snowshoe hare.
Gunnison's prairie dog *Cynomys gunnisoni*	C	Lake		ODR	Shrub-grassland habitats between 6,000-12,000 ft.in mesic plateaus, intermountain valleys, benches and arid lowlands
North American Wolverine *Gulo gulo luscus*	C, S	Lake Eagle	X		alpine & subalpine mature/intermediate timbered areas around natural openings, including cliffs, slides, basins, & meadows, dependant on ungulates, historically in CO, extending the length of the Rocky Mts.

Only those federally threatened, endangered and proposed/candidate species with the potential to occur (i.e., habitat is present) within the Analysis Area or be affected by the proposed alternatives are addressed hereafter in this assessment (evaluated species). Species shown in the table above as excluded will not be analyzed further based on the

rationale provided here and in Wrigley et al. (2012). The proposed alternatives will have no effect/impact to those species.

7.3 Evaluated Species Information

See Wrigley et al. (2012) for species account information for the TES species analyzed further in this document.

7.4 Field Reconnaissance

Informal field reconnaissance of the project area has occurred during interdisciplinary team member field visits in summer of 2011 and 2012 to determine physical and biological characteristics including dominant vegetation types, topography, administrative boundaries, and watershed boundaries. Canada lynx were confirmed within the project area during a research study led by Liz Roberts of the White River National Forest and John Squires of the Rocky Mountain Research Station in Montana. Three adult lynx were tracked, live trapped, collared and released in March of 2013. District biologist, Jeni Windorski, helped the visiting lynx crew to survey, track, trap and handle the lynx during several days of their stay on the Leadville District. Game cameras also confirmed presence of lynx within the project area in 2011 and 2012. No surveys have been conducted specifically for wolverine for this project and there were no incidental observations or tracks observed for wolverines during other species surveys either.

8.0 ENVIRONMENTAL BASELINE

As defined under the ESA, the environmental baseline includes past and present impacts of all federal, state, and private actions in the action area; the anticipated impacts of all proposed federal actions in the action area that have undergone formal or early section 7 consultation; and the impact of state and private actions which are contemporaneous with the section 7 consultation process. Future actions and their potential effects are not included in the environmental baseline. This section in combination with the previous section, *2.0 Consultation History* and associated Table 6 below, and separate document *Threatened, Endangered, and Forest Service Sensitive Species on the Pike and San Isabel National Forests* (Wrigley 2012) defines the current status of these species and their habitat and provides a platform to assess the effects of the proposed action under consultation with the FWS. The LRMP identifies past and planned FS activities on the PSICC, which includes the San Isabel National Forest. In addition to the activities identified below, please refer to the LRMP for additional information regarding federal actions on the Forest. Many of these are ongoing activities and can be also considered as cumulative effects and are applicable to the cumulative effects analysis in the *Effects to Species* (*Section 9.0*) below.

8.1 Past Consultations for Previous Actions in the Analysis Area

Table 6. Past consultations with the FWS and determinations for actions within the Analysis Area (Tennessee Pass and Massive LAU scale) for all federally listed and candidate/proposed species.
[1] NE=No effect, NLAA=Not likely to adversely affect, LAA=Likely to adversely affect.

Project	Project Type	Species	Determination [1]	Year
Region 2 Programmatic Review of Grazing Allotments Supplement in 2001 for Canada lynx	Grazing	Lynx	NLAA	2001
Box Creek Watershed Restoration	Vegetation/Travel Management	Lynx	NLAA	2002
White Mountain Snowmobile Tour Relocation	Recreation	Lynx	NLAA	2006
Northwest Leadville Fuels Reduction Project*	Fuels/Vegetation Treatment	Lynx	NLAA	2006
Twin Lakes Prescribed Burn	Habitat Improvement	Lynx	NLAA	2006
Continental Divide National Scenic Trail (CDNST)	Recreation	Lynx	NLAA	2006
Sangre Winter Trail	Recreation	Lynx	NLAA	2007
Leadville Sled Dog Race	Recreation	Lynx	NLAA	2007
Salida/Leadville RAMP	Grazing	Lynx	NLAA	2008
Kay Mining Claims Exploration	Mining	Lynx	NLAA	2008
LeadSled Snowmobile Week	Recreation	Lynx	NLAA	2008
Leadville Sled Dog Race	Recreation	Lynx	NLAA	2008
Flume Creek Timber Salvage	Fuels/Vegetation Treatment	Lynx	NLAA	2009
North Forebay Salvage	Fuels/Vegetation Treatment	Lynx	NLAA	2009
Trans Rockies Run SUP	Recreation	Lynx	NLAA	2009
10th Mountain Division Huts SUP	Recreation	Lynx	NLAA	2009
Leadville Sled Dog Race	Recreation	Lynx	NLAA	2009
Ski Cooper Projects	Recreation	Lynx	NLAA	2010
Tennessee Pass Nordic Center SUP	Recreation	Lynx	NLAA	2010
Leadville Sled Dog Race 5 year SUP	Recreation	Lynx	NLAA	2010
Box Creek Salvage	Vegetation Treatment	Lynx	NLAA	2010
Adventure T.E.A.M. Challenge	Recreation	Lynx	NE	2010
Various Guided Recreational Activities	Recreation	Lynx	NE	2010
Historical sites Defensible Space	Fuels/Vegetation Treatment	Lynx	NLAA	2011
Mt. Elbert Mining Reclamation	Vegetation Reclamation	Lynx	NE	2011
Ski Cooper Magic Carpet	Recreation	Lynx	NLAA	2011
Campground Electrical Conduit Line	Recreation	Lynx	NE	2011
Army Special Forces Winter Training SUP	SUP	Lynx	NLAA	2012
Leadville Timber Stand Improvement Project *	Vegetation Treatment	Lynx	NLAA	2012

**The Northwest Leadville Fuels Reduction project and the Leadville Timber Stand Improvement project is inside the Tennessee Creek Project boundary and is included in the proposed acres. The combined acres of these three projects are not cumulative, rather inclusive.*

8.2 Past and Current Activities within the Analysis Area

The following past and ongoing actions are part of the environmental baseline. The effects they have on the species addressed in this assessment are added to the direct/indirect effects of this project to assess the cumulative effects of the proposed project. The following is a summary of specific activities for these species that have occurred within the analysis area. Each of the below activities have incrementally impacted Canada lynx directly and indirectly, through fragmentation, habitat loss, loss of habitat connectivity affecting movement and loss of habitat effectiveness through these anthropogenic activities.

- *Historic Mining Activities* - Historic mining activities have had impacts on many species and are responsible for shaping the landscape and vegetation today. Historic uses of the Forest included intensive use by miners, market hunters, and trappers. During the mining boom in Colorado, many backcountry locations contained railroads and established towns with year-round human populations. Mining has caused alteration of habitat, leaching of heavy metals in to streams changing stream pH, erosion, and sedimentation into streams. Activities associated with mining that affect species include road and railroad development, timber harvest, weed invasion, and revegetation efforts. Much of the mixed conifer was harvested for mining timbers, fuelwood, and charcoal. Snags and CWD that provide important habitats were also harvested for fuel which are lacking today. Many of the large diameter trees were removed. Within some areas, only lodgepole and aspen were regenerated, reducing species diversity.

- *Fire suppression* - Fire suppression has led to increased fuel loading and canopy closure. Fire suppression has prevented natural thinning of the predominately lodgepole stands and limited tree growth. These small, dense lodgepole stands are now relatively homogenous and are more susceptible to abnormal levels of insect and disease populations and tree mortality. Few snags were created as a result of fire suppression and existing snags were harvested for fuel. These historic activities combined to produce a forest that has smaller trees, less structure (snags and CWD), less species diversity, and a low stand age diversity (more older stands).

- *Timber harvest/Hazardous Fuels Removal* – Vegetation management (thinning, group selection, patch cuts, chipping of slash, and fuelwood) within the foot print of the campgrounds/developed sites at Halfmoon Creek and Turquoise Lake are ongoing. Annual treatments in these areas average 7 – 10 acres per year. *Northwest Leadville Hazardous Fuel Project* continues on a limited scope. Treatments would include pre-commercial thinning, thinning of mature stands and pile burning with annual treatments averaging 10 – 20 acres per year for the next 3 years. Small scale timber removal occurs occasionally on private lands.

- *Grazing*- Grazing leads to biomass removal and trampling. It has led to changes in species composition, compaction of soils, changes in fuel loading and the fire regime, downcutting of riparian areas with subsequent drying of adjacent meadows, and noxious weed invasion. Within riparian areas and wet meadows livestock grazing has led to churning of the soil and hummocking. Grazing was

widespread in the early 1900's on the Forest and adjacent lands. There are no active grazing allotments within the Tennessee Creek Project area.

- *Recreation*—Motorized touring (i.e., automobiles, four-wheeled drive vehicles, OHV's, and snowmobiles) is a popular recreational activity on the Forest, followed by camping, hiking, biking, mountain climbing, fishing, hunting, skiing, snowshoeing, boating, and horseback riding. Recreation use on the Forest within the project area is high. Use is year round with OHV, automobiles are prevalent in the summer and extensive snowmobile use occurs in the winter. Two major campground facilities are within the project area, Halfmoon Creek and Turquoise Lake campgrounds. Ski Cooper, a small ski area accessing approximately 400 acres of skiable terrain, is also within the project area. Recreationists also access several 10th Mountain Division Huts year round via ski, snowmobile, or hiking; three of which are near the project area. Permitted recreational races are very popular on the district and within the project area, including large events such as the Leadville Trail 100 series as well as other bike, foot and ski races. A portion of the Continental Divide National Scenic Trail (CDNST), sections of the Colorado trail and popular trailheads accessing 14,000 ft. peaks (such as Mt. Massive and Mt. Elbert) are also located within the project area. Motorized and non-motorized recreational use (including OHV use, snowmobile, camping, horseback riding, mountain biking, hiking, hunting, and fishing) has led to the development of non-system roads and trails, development of dispersed campsites, erosion, disturbance to wildlife species, and the vectoring of invasive and noxious weeds in previously pristine areas. Roads in particular increase soil erosion, increase sedimentation, fragment, and directly remove, habitat, and facilitate the spread of invasive and noxious weeds. The spread of noxious weeds has led to changes in species composition of the Forest and increased competition with native plant species which have adversely affected many plant and wildlife species. Each of the above activities have incrementally impacted wildlife species addressed in this assessment directly, indirectly, and cumulatively through fragmentation, habitat loss, and loss of effectiveness through human disturbance.

- *Human development*—Subdivision and development of private lands within the analysis area adjacent to federal lands is expected to continue to increase. The land surrounding federal lands is sparsely populated with large tracts of land per person. There are private in-holdings with structures located near the project area. This will continue to impact and fragment species habitat, fragment and isolate populations, increase the risk of weed invasion, and increase the incidence of wildfire. Human population growth has remained fairly flat over the past decade in Lake County, and a relatively small population growth is predicted over the next decade.

- *Climate change* – It has been well documented in numerous studies that the world is warming. U.S. average temperatures have increased more than 2°F in the last 50 years, and are projected to increase further (USGCRP 2009). Numerous studies have shown shifts in density, which can be created by a change in abundance within the range of species, and/or a shift in range boundaries. Ultimately, the greatest impact on plants and wildlife may not be from the climate change itself, but rather from the rate of change. Given enough time,

many species would likely be able to adapt to shifts in the climate, as they have done in the past. However, the current projected rate of warming is thought to be greater now than has occurred at any time in the last 10,000 years (Intergovernmental Panel on Climate Change (IPCC) 2007). Deep snowpack levels create a competitive advantage to species like lynx and are essential for denning habitat for wolverine. Climate change has the potential to affect factors that influence lynx and wolverine and their habitats in the Southern Rockies. Resource managers must consider climate impacts in the context of multiple natural and human-induced changes that are already expressively affecting species, habitats, and ecosystem functions and services, including habitat loss, fragmentation and degradation, invasive species, over-use, and disease.

9.0 EFFECTS TO EVALUATED SPECIES AND DETERMINATIONS

See Wrigley et al (2012) for species account information applicable to species being addressed under this Biological Assessment.

9.1 Cumulative Effects (Applicable to all Wildlfe Species Addressed)

Because many cumulative effects are applicable to each species, the following is a general discussion of the effects from these activities and is pertinent to all species addressed. Additional cumulative effects are also discussed later for a particular species as well, if there are more detailed effects for that species. Cumulative effects are defined somewhat differently under ESA and NEPA. Under ESA, cumulative effects include the environmental baseline plus the additive effect of reasonably foreseeable future state, private and tribal activities. Under ESA cumulative effects, we do not consider the effect of future federal actions. Under NEPA, the cumulative effects are almost identical to those described for ESA, the only difference being that NEPA cumulative effects also include the effect from reasonably foreseeable future federal actions as well. Also see additional cumulative effects in T*hreatened, Endangered, and Forest Service Sensitive Species on the Pike and San Isabel National Forests* (Wrigley 2012) which can be found on file at the District which is incorporated by reference here as well.

Below is a summary of future federal and non-federal (private, state, or tribal) activities that are reasonably likely to occur within the action area that directly and indirectly affect species addressed in this assessment. These are added to the environmental baseline (discussed above in Section 8.0). In many instances, those past activities and their effects remain to this day and are currently ongoing as well.

- Mining (on non-federal/federal lands) can cause destruction of habitat, leaching of heavy metals in to streams changing stream pH, erosion, and sedimentation into streams. Some smaller (less than 5 acres) active mining claims are within the analysis area. For the most part, future mining activities are expected to be much less common and at a smaller-scale than has occurred historically. These activities have and will continue to affect wildlife species addressed here indirectly and cumulatively through fragmentation, habitat loss, degradation of habitat, and loss of effectiveness through human disturbance.

- Fire suppression (on non-federal/federal lands) has led to increased fuel loading, tree density, and canopy closure in some areas – particularly lower elevations where the fire-return interval is shorter than the longer intervals in high

elevation forested ecosystems. For example, fire suppression has prevented natural thinning of the predominantly lodgepole and ponderosa pine stands and limited tree growth in many areas. These small, dense stands are now relatively homogenous and are more susceptible to high levels of insect and disease populations and tree mortality (which ultimately results in more open areas as trees die). Few snags were created because of fire suppression and existing snags continued to be harvested for fuel. These historic activities combined to produce a forest that has smaller trees, less structure (snags and CWD), less species diversity, and a low stand age diversity (more mid-seral forests) that have directly and indirectly affected many of the wildlife species addressed here. Future suppression activities are expected resulting in a continuation of these effects. However, an increased amount of prescribed fire and use of natural fires is also expected in the future which would lessen the impacts stated above, benefiting many of the species that have evolved with fire as a major disturbance.

- Numerous activities require continued use of, and/or construction of new roads and trails on both federal and non-federal lands. New roads in particular (as discussed above and in Wrigley et al. 2012) increase soil erosion, sedimentation, fragmentation, directly remove habitat, and facilitate the spread of invasive and noxious weeds and predators (e.g., corvids). The spread of noxious weeds will continue to lead to changes in species composition of the Forest, increased competition with native plant species, and altered fire regimes that will adversely affect many plant and wildlife species addressed here. On-going and future motorized and non-motorized recreational use (including OHV use, camping, horseback riding, mountain biking, hiking, hunting, and fishing) will continue to lead to the development of non-system roads and trails, development of dispersed campsites, erosion, disturbance to wildlife species, and the vectoring of invasive and noxious weeds and predators in previously pristine areas. Each of these activities is expected to continue and increase in the future and will adversely impact wildlife species directly, indirectly, and cumulatively through fragmentation, habitat loss, degradation, and loss of effectiveness.

- The Forest and adjacent ownerships are an important resource providing for a wide variety of public recreational activities, which are expected to continue to increase in the future as the population of the region continues to grow (LRMP). A substantial amount of public recreation currently occurs over the entire analysis area. Use by the general public in some areas of the District is substantial. An average of approximately 77-90% of the overall recreation use on the District is from public recreation in some important mountainous areas. The attractions of climbing "14er peaks" and high elevation lakes draw people to these scenic mountains. As populations in Colorado and the Front Range continue to grow, there will be increasing use of the backcountry for recreational activities, which will increasingly harass wildlife species and destroy their habitats. In areas of concentrated public recreation, effects from future public recreation will contribute to cumulative effects to each of the species addressed.

  Other motorized use by the public, such as snowmobile use is unrestricted over the entire District (outside of Wilderness Areas). Snowmobile riders are only limited by their machines, terrain, and snow conditions. Public use during the

winter is widespread over the District (depending on snow condition) and their use is currently not regulated by the Forest Service or restricted to designed snow compaction routes. This increases in orders of magnitude the impacts from snow compaction, noise disturbance, and numerous other impacts to habitat and species (namely lynx) from these and other similar recreation activities. For example, general public recreation uses in several important high winter concentration areas is noteworthy – particularly in winter. General public use accounts from about one-half to 90% of the winter recreation within these areas. Given the existing and anticipated annual increase use in public use, these recreation activities occurring on the Forest may impact these species addressed even further. Impacts from these activities to wildlife are increased considerably from this additive use.

Non-motorized activities by the general public occur frequently in roadless, remote backcountry locations (e.g., horseback, hiking, snowshoeing, skiing). In areas where general recreation use is low (e.g., backcountry), effects from public recreational activities may be of greater influence on these species due to habitat modification (e.g., snow compaction and ground disturbance), changes in wildlife species composition (increased predators), and noise disturbance to wildlife in remote areas. Outside of wilderness areas, motorized winter and summer use will also occur. As discussed above, recreation activities have influenced the travel system in the analysis area and this is expected to increase into the future. Motorized OHV use is restricted to designated routes; however, compliance is not often achieved. Increased use of OHVs for recreational use has resulted in an extensive "user-created" network of travel routes. As these new routes become more established over time, they will eventually be viewed by the public as system routes. The continued creation of new roads/trails will decrease the habitat effectiveness and capability within the analysis area. Roaded areas will also receive heavier recreational use because of easier access.

Many of these types of recreation use can lead to habituation or harassment of animals, depending on the factors listed above in the previous section. Effects of recreation activities on these species vary and depend on the type of activity as well as the species affected. Not only does recreation have direct effects to these species, but also indirect effects on animal populations are likely to be substantial but also there is little rigorous documentation on these impacts (Cole 1995). *"Recreational activities clearly have substantial and generally adverse influences on terrestrial vegetation and soil, and on aquatic systems. Since these provide living space, shelter, and food for wildlife, animals are affected by these changes. For vertebrates, amphibians, reptiles, small birds, small mammals, and many fish, these indirect effects are likely to be more substantial than direct impacts from recreationists"* (Cole 1995). Each of the above activities will continue to increase in the future both on and off-Forest, incrementally causing noteworthy impacts to wildlife species addressed in this assessment directly, indirectly, and cumulatively through fragmentation, habitat loss, degradation, and loss of effectiveness through human disturbance. These activities are expected to increase and have even greater impacts in the future.

- The impact of invasive plants (weeds) and animals (which can displace native/desirable wildlife species – e.g., cowbirds) on biodiversity is a major

concern on all land ownerships in North America. Although the magnitude of the effects of non-native invasive plant and animal infestations specifically on these species' habitat has not been fully understood, the potential exists for large-scale impacts and alteration of habitat. Potential exists for large-scale impacts and alteration of wildlife habitats due to non-native infestations. Invasive weeds such as diffuse and spotted knapweed (*Centaurea diffusa* and *C. maculosa*), leafy spurge (*Euphorbia esula*), rush skeletonweed (*Chondrilla juncea*), dalmation toadflax (*Linaria dalmatica*), and Canada thistle (*Cirsium arvense*), cheatgrass (*Bromus tectorum*), and many others have the potential to alter habitats important to these species at both the local and ecosystem scale (Ruediger et al. 2000). Many of these plants are more easily eradicated at the level of a few plants or a few acres. Once established, they spread aggressively and become extremely difficult to control. Invasive species impact natural habitats, alter ecosystem processes such as nutrient cycles and fire regimes, and reduce biodiversity. Invasive species have and will continue to cause devastating effects directly on many wildlife species and their habitats. Actions could include efforts to prevent the establishment of new weed populations, controlling the spread of existing infestations, providing information to the public, and cooperating with other agencies and landowners in developing and implementing prevention and control programs. The Rocky Mountain Region Invasive Species Management Strategy (U.S. Forest Service 2008) addresses the management, control, and treatment of weeds in order to minimize effects, although these plants and their effects will not be eliminated.

- Future non-federal and federal water development projects such as municipal water sources for surrounding towns and cities – particularly to satisfy the growing demand of the Front Range Region are anticipated to impact these wildlife species and their habitats directly, indirectly, and cumulatively in the future through water depletion, fragmentation, and habitat loss. Additional ditching and draining will negatively impact wetlands throughout the western United States. Ditching and draining has been implemented for a variety of reasons, including creation or improvement of livestock pasture, conversion of wetlands or wet meadows for agriculture (particularly hay production), water diversion, mining, and peat mining. Ditching or draining alters water relations within the wetland, leading to numerous secondary effects such as species composition change, easier access to livestock, wildlife, and motorized vehicles, colonization by invasive plant species, and others. These activities are expected to increase in the future.

- Future timber harvest and thinning on both federal and non-federal lands will lead to a more open forest canopy with additional light reaching the forest floor affecting microhabitats, moisture, etc. (which may be beneficial or detrimental depending on the species), soil disturbance and compaction, development of skid roads, noxious weed invasion, and other effects. Changes in forest composition, structure and fire frequency have also taken place and will continue to do so with future projects. This may particularly be detrimental to species requiring denser forests with higher canopy cover, older-aged forests, high amounts of snags, logs/CWD, etc. although they may benefit those species preferring more open and younger-aged forests, shrublands, etc. These actions have and will continue to incrementally impact many wildlife species addressed here in the

future directly, indirectly, and cumulatively through fragmentation, habitat loss, degradation, and loss of effectiveness through human disturbance. In addition, to the general activities outlined above, several small individual hazardous fuels and salvage projects are currently being implemented by the Leadville District within the analysis area. These activities have and will negatively affect to varying degrees these species and their habitats directly, indirectly, and cumulatively as discussed previously.

- Human development is expected to continue in the analysis area on private lands as well. The population in Lake County and surrounding counties within the analysis area is expected to continue to increase approximately 2-3% annually over the next 30 years (Colorado Department of Local Affairs (CDLA) 2013) which will further impact wildlife species and habitats. As more and more private lands adjacent to the Forest are developed, this could adversely affect many plant and wildlife species by the following: direct habitat loss, increased fragmentation, further isolate populations, increased frequency and intensity of human disturbance, increased recreational use from nearby residents, and increased risk of weed invasion. In addition, housing units and human developments within wildland/urban interface areas immediately adjacent to the Forest substantially increase the risk of wildfires on the Forest that also will affect habitat for these species. This will cause direct and indirect adverse effects to wildlife and their habitats through direct and indirect habitat loss and degradation.

- While climate fluctuates naturally, it is widely accepted that weather patterns (temperature and precipitation) in the western United States is changing significantly and these changes will continue to affect wildlife distributions and habitats. For example, riparian areas have been, and will increasingly be impacted as a result of decreased water availability leading to lowered peak flows and a decrease in the area, intensity, and duration of wetted soils. Shifts and changes in wildlife habitats are expected to pointedly affect wildlife and their habitats as a result of changes in temperature and precipitation. Vegetation dynamics, disturbance, and climate and their interactions are key elements in predicting the future condition of ecosystems and landscapes and the vulnerability of species and populations to climatic change. Climatic factors such as temperature, precipitation, and wind patterns are among the many factors that influence vegetative structure and composition, fire behavior and wildlife habitat. Changes in general climate trends in North America during the past 100 years include (Inkley 2004)
    - **Temperature**
        - Global surface temperatures increases
        - Increase in night-time low temperatures
        - Greater warming on land than on water
        - Greater warming at higher temperatures
        - Fewer days of extreme low temperatures
        - More days of extreme high temperatures
        - Greater warming in winter than in summer
    - **Precipation**
        - Increased frequency of precipitation events
        - Increased intensity of extreme precipitation events

        - More areas with increased precipitation than decreased
    - **Other climate factors**
        - Increased cloud cover
        - Sea level rise
        - Reduced snow cover
        - Receding glaciers
        - Thinner and less areal coverage of Arctic sea ice.

Other indirect effects of climate change may have beneficial or detrimental effects on many of the species addressed here. A recent study of the effect of climatic change on wildfire in the western U.S. (McKenzie 2004) determined that with warming climate, fire seasons will likely be extended and that total area burned is likely to increase. As a result, important changes in the distribution and abundance of dominant plant species in some ecosystems may occur. Some species that are sensitive to fire may decline, whereas the distribution and abundance of species favored by fire may be enhanced. For example, stand replacing fires are a common occurrence throughout much of lynx habitat and often provide conditions conducive to producing good quality snowshoe hare habitat.

The complexities of climate change described above are likely to affect wildlife and ecosystems in equally complex ways, and vary tremendously. For example, increased nighttime temperatures could markedly influence the range patterns of species with life histories especially influenced by ice or snow cover, or other species that require certain minimum temperatures to induce physiological changes (seed germination for example). These same species could be largely unaffected by increased daytime temperatures however.

In response to projected climate changes in the next 100 years, the geographic ranges of North American flora and fauna (plants and animals) are expected to shift upwards in elevation and generally northward (IPCC 2002). Temperature, rainfall, soil moisture, and specific physiological requirements of each species addressed here are expected to be driving forces in these shifts. Range shifts of wildlife are likely to depend upon factors such as the availability of migration corridors, suitable habitats, and the concurrent movement of forage and prey species. Further complicating potential range shifts will be other landscape changes such as roads, cities and habitat fragmentation, all of which can present significant barriers to species range shifts (Inkley 2004). These changes will have profound effects on wildlife, their habitats, and entire ecosystems.

In summary, there is incomplete or unavailable information upon which to base any more detailed analysis of climate change risk factors for many of the wildlife species addressed here. The best available information indicates that climate change poses potential important risks, but the exact nature of these risks remains uncertain at this time.

Future federal reasonably foreseeable actions include a large scale vegetation treatment project currently in the beginning stages initiated by the Bureau of Land Management (BLM), **Vegetation Manipulation Management: Chaffee and Lake County Planning**

(draft proposal on file at district office). This project would be a joint effort between the BLM and the USFS in which up to two miles of forest service land adjacent to BLM parcels could be treated. The proposal includes all BLM lands in Chaffee and Lake County as well as the adjacent federal forest lands. Though the majority of lands proposed in this project are not located in lynx habitat, there are some acres of lynx habitat in northern Lake County (also within the Tennessee Pass LAU) that could be affected by this proposal.

This BLM project could contribute to cumulative effects should treatments take place in lynx habitat. Coordination would be key in ensuring that thresholds for LAUs would not be exceeded and that retention of high quality stands would occur. Ongoing discussions between the FS and the BLM wildlife biologists facilitate this goal. The effects on Canada lynx of the *Vegetation Manipulation Management* projects would likely be similar to those mentioned for the Tennessee Creek Project.

Each of the activities discussed here in the Environmental Baseline will adversely affect wildlife by degrading habitats, reducing habitat effectiveness, fragmenting habitat, affecting behavior and reproductive success, causing impacts in the short and long-term. If adverse effects are not minimized at the local level, cumulative effects may occur. Past, present and future management activities have caused and will continue to result in changes in plant community structure and composition across many habitats. These management activities have and will continue to alter present landscape to various degrees and have direct, indirect, and possibly cumulative effects on many wildlife species and their habitats. The proposed action would add to these effects.

9.2 FEDERALLY LISTED SPECIES

9.2.1 Canada lynx (*Lynx canadensis*)

This analysis for Canada lynx is based on the new Pike/San Isabel Lynx Habitat Map submitted to USFWS for concurrence in December of 2013. This map uses the best scientific available information as well as the latest advances in modeling and mapping of habitat. In general, for the Leadville Ranger District and this project area, climax dry lodgepole is no longer mapped as lynx habitat and LAU sizes were shrunk to extents recommended by the Lynx Conservation Assessment and Strategy; providing for a more conservative approach when considering treatment thresholds. All SRLA standards, guides, "currently unsuitable" thresholds, etc., would still be met for this project if it had been analyzed under the old map.

The Tennessee Creek Project Area is located within the Tennessee Pass and Massive LAUs. On National Forest lands within the Pike and San Isabel Forest, there are approximately 897,306 acres of mapped lynx habitat with 19,953 acres of those falling inside Tennessee Pass LAU and 22,114 acres falling inside the Massive LAU.

"In the southern portion of its range (within which this project lies), lynx populations appear to be limited by the availability of snowshoe hare (*Lepus americanus*) prey, as suggested by large home range sizes, high kitten mortality due to starvation, and greater reliance on alternate prey, especially red squirrels *(Tamiasciurus hudsonicus*), as compared with populations in northern Canada." (Ruediger 2000). The highest quality snowshoe hare habitats are those that support regenerating trees or shrubs that are available above the snow during the winter. Stands that provide 35% or greater dense

horizontal cover (DHC) fall into this category. This condition can be present in regenerating stands as well as an understory layer in mature stands. Red squirrel densities tend to be highest in mature cone-bearing forests with substantial quantities of coarse woody debris (Ruediger 2000).

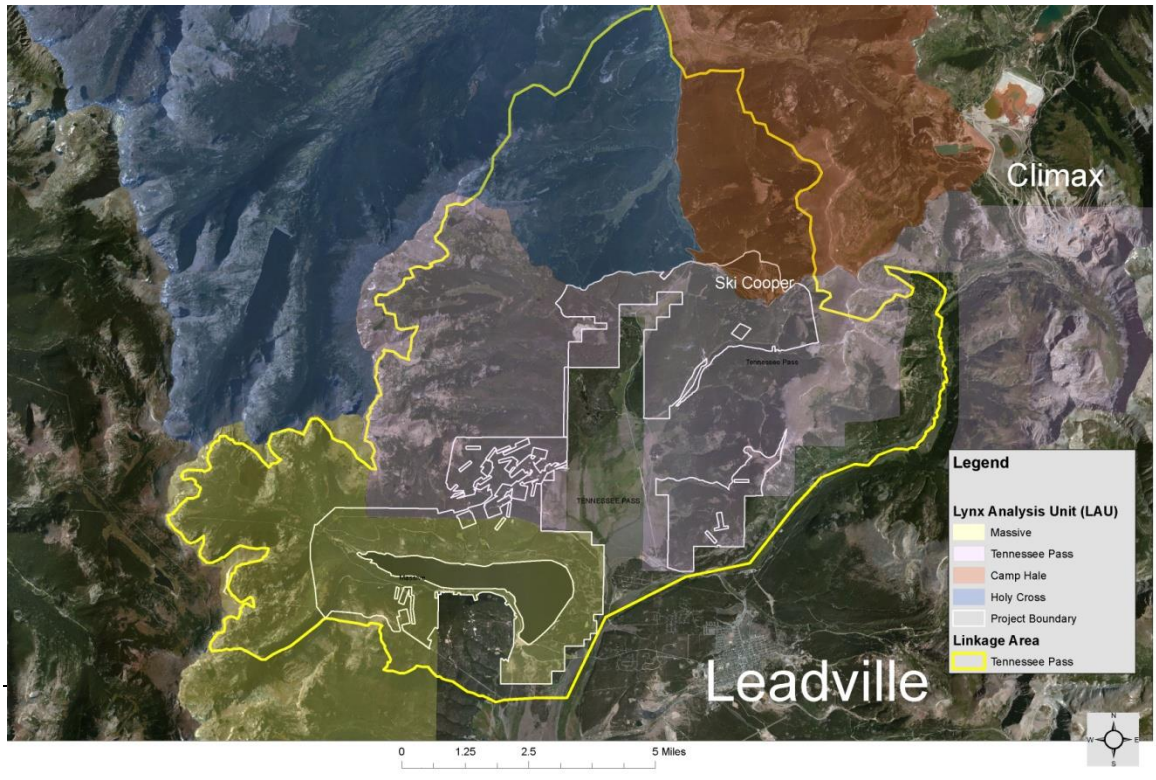
The project area contains extensive amounts of lynx habitat (seral lodgepole, spruce-fir and aspen) that are known to support snowshoe hare populations (field observations J. Windorski 2011-2013). The area also supports alternate lynx prey species such as red squirrel.

As mentioned above, lynx are currently found inside the project area. This was evident during the research project conducted in February and March of 2013. All three lynx were trapped and released inside the Massive LAU within spruce/fir/lodgepole forests near designated wilderness areas. Tracks were also observed outside of the research area in southern portions of the Massive LAU as well. Game cameras and observations by recreationists (confirmed with photos) revealed that up to three lynx were spending time in the Tennessee Pass LAU in the winter of 2011-12. The current habitat in the project area is supporting at least 3 lynx but population estimates for the LAUs are not available.

Linkage Areas

Most of the Tennessee Creek Project boundary (16,450 acres) is entirely within the much larger Tennessee Pass Linkage Area (67,500 acres) and any potential impacts to it will be addressed appropriately below. The Halfmoon portion of the Tennessee Creek Project is not within any linkage area. The Tennessee Pass Linkage Area is made up a portion of the Tennessee Pass LAU as well as most of the Massive LAU (see Map 4 below) from the San Isabel NF. There are portions of the Camp Hale and Holy Cross LAUs from the White River NF included in the northern end of the linkage area. There is no part of the linkage area that is outside of an LAU.

Map 4. Tennessee Creek boundary (white line) within the Tennessee Pass linkage area (yellow line), along with the four LAUs comprising the linkage area.



Direct and Indirect Effects

No Action Alternative

Because there is no proposal or change associated with this alternative, the effects here are in relation to what is currently happening on the landscape within the Tennessee Pass and Massive LAUs. Due to ongoing projects or natural processes, there may already be effects (positive or negative) taking place. Please see section 8.2 above for a discussion of past and ongoing activities and effects.

The natural biological/ecological processes (unrelated to project activities) would continue to cause changes in structural stages and plant community compositions in a dynamic way across the project area. Continued persistence of mature lodgepole with minimal understory development could continue in most places over some time. However, natural disturbances such as fire, insects, disease, wind, and ice/snow damage, etc. would set back seral stages in a patchwork or mosaic fashion over time. Wildland fires that mimic the natural fire regime intensity and severity would aid in improving the long-term biodiversity and heterogeneity of the area. However, wildfires occurring outside of wilderness usually are fully suppressed. Natural disturbances would likely benefit lynx in the project area as well as within the LAUs. Additional mortality of conifer trees through spruce or pine beetle would likely facilitate new growth of regenerative lodgepole and spruce-fir trees. It may take approximately 15-30 years (for lodgepole) following forest management practices or fire for conifers and /or brush species to regenerate to heights sufficient to extend above average winter snow levels and create high quality habitat for snowshoe hare (Ruediger 2000). At these elevations, it would likely take longer (40+ years) for spruce/fir to reach these levels. Tree conditions currently on the forest are vulnerable to insect and disease mortality. The monoculture of mature lodgepole pine coupled with the current drought, which stress trees further, provide precarious conditions for the landscape as a whole. Just north of the Tennessee Pass divide, a major pine beetle epidemic has created mass mortality of the forests in that region. South of the project area in Gunnison and more closely on Monarch Pass near Salida, the spruce beetle has begun its course of reaching epidemic proportions as well. So as small scale, endemic outbreaks could contribute to a diverse landscape, the conditions are such that die-offs would likely be of epidemic proportions, thereby facilitating a continuation of homogenous landscapes. However, it is impossible to predict the frequency and duration of natural disturbances. Some disturbances could happen at most anytime and others may not occur for decades or even a century or more. Lynx have evolved with smaller and large landscape disturbances such as fire, wind, insects, and disease and have adapted to these landscape dynamics.

The continuation of small scale (10-20 acre) treatments inside the project area may or may not contribute to increased foraging (when regeneration occurs) for snowshoe hare, the primary prey of Canada lynx. Some of the treatment areas (portions of the Northwest Fuels Project, Turquoise Lake and Halfmoon campgrounds) are not in lynx habitat or have proposed thinnings which may not open up the forest floor enough to promote much regeneration.

Continued fire suppression contributes to the continuation of forests with little age or species diversity. Crown cover continues to develop, blocking light from the forest

floor, which prohibits much, if any, regeneration or development of grass, forbs and shrubs in forested areas.

Recreational disturbances currently occurring within each LAU and within the project area specifically would continue to impact lynx to various levels. Areas are likely avoided by lynx currently due to high number of people (Ski Cooper, Turquoise Lake and Halfmoon campgrounds) but in other areas where recreation is more dispersed, lynx may not be impacted as much. Generally, lynx are somewhat tolerant of human presence and most investigations of lynx have not shown human presence to influence how lynx use the landscape (Ruediger 2000).

Interrelated and Interdependent Actions
There would not be any interrelated or interdependent activities with the No Action alternative.

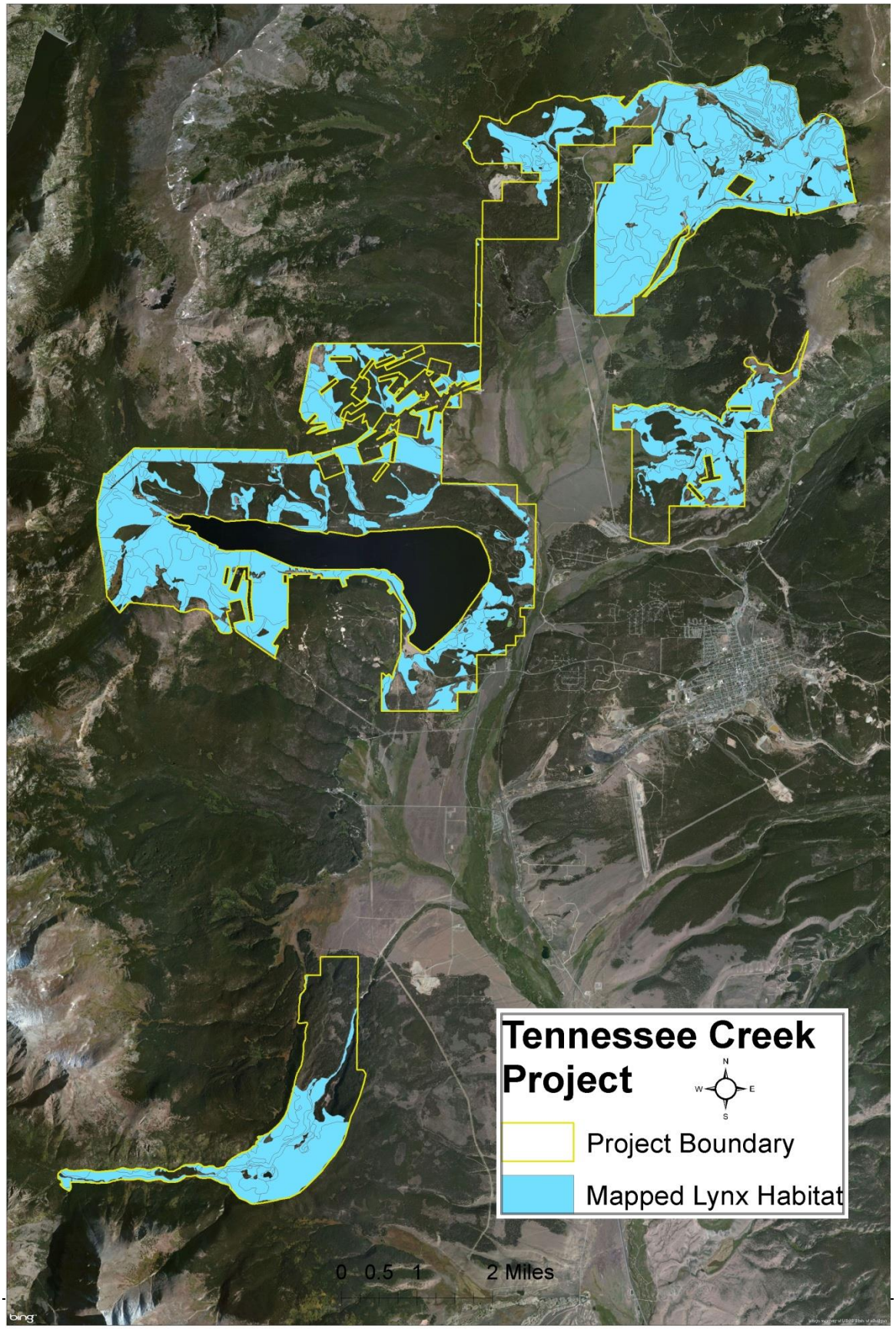
The above ongoing activities have incrementally impacted Canada lynx directly, indirectly, and cumulatively through fragmentation, habitat loss, and loss of effectiveness through human disturbance of their habitats. Because lynx habitat is constantly changing and evolving through natural processes/disturbances or the actions discussed above, the no action alternative "**may affect, is not likely to adversely affect Canada lynx."**

Alternative 1 (proposed action)

Of the 16,450 acres within the entire Tennessee Creek Project area, approximately 9,480 acres are mapped lynx habitat (see Map 5 below). A very generalized description of lynx habitat consists of seral lodgepole (lodgepole pine with >5% spruce/fir canopy cover), spruce/fir, aspen with spruce/fir as >5% canopy cover, cool-moist mixed conifer, or riparian/willow environments (*Please refer to the 2013 Pike/San Isabel lynx habitat re-mapping document for more details on modeling lynx habitat which can be found on file at the district office*). Some lynx habitat may be more valuable than others depending on site characteristics such as percentages of dense horizontal cover (DHC) for snowshoe hare foraging and CWD (coarse woody debris) levels for lynx denning. Stands that have >35% DHC would be retained within the project area as these are considered higher quality foraging sites for snowshoe hare, the primary prey species for Canada lynx (U.S. Fish and Wildlife Service and U.S. Forest Service 2009). These high quality stands would be identified and marked appropriately by personnel trained to measure horizontal cover with coverboards (a wildlife biologist or forester and/or crew that has been trained by the biologist). These areas would be identified on the ground and excluded from treatment. Stands that have obviously high horizontal cover as well as those with very low horizontal cover would not need to be measured as exclusion or inclusion in treatments would be obvious. The Tennessee Pass LAU and Massive LAU have 19,953 and 22,114 acres of modeled lynx habitat respectively (U.S. Forest Service 2013). The following table shows the amount of lynx habitat for the PSI Forest as well as within each LAU within the project area and the acres of proposed treatments. Lynx habitat is mapped as such according to the criteria developed for the re-mapping process and treatments will not be separated according to tree species for this analysis. If it has been mapped as lynx habitat, it will be treated as such regardless of whether it is seral lodgepole, spruce/fir, aspen, etc., while acknowledging the fact that some lynx habitat

may be of higher quality than others (dense spruce/fir vs. more open seral lodgepole pine).

Map 5. Mapped lynx habitat within the Tennessee Creek Project.



It should be noted up front that all implementation proposals and analysis thereof, ***assume*** that all treated acres within this proposal are lynx habitat. This is being done because implementation locations are not being pre-determined and therefore, we cannot determine how many acres of lynx habitat will actually be affected. Though the much of the project area is mapped as lynx habitat, approximately 6,970 acres is not and the quality or effectiveness of each stand is not specified. There are approximately 9,480 acres of mapped lynx habitat in the project area. To err on the side of caution and conservation, this analysis assumes this hypothetical situation; that all 9,480 acres of lynx habitat out of the total 13,580 treatable acres (6,640 acres in the Tennessee Pass LAU and 6,940 acres in the Massive LAU – see table above) within the project will be treated. However, we know that this is certainly not the case and the acres of treated lynx habitat will, in reality, be much less, but it cannot be quantified at this time; so we must consider the greatest extent of treatment possible. Acres that are actually treated in lynx habitat will be tracked and reported annually to the FWS according to reporting requirements outlined in the SRLA.

Table 7. Acres of lynx habitat proposed for treatment. Again, this is assuming that all lodgepole pine, aspen and spruce/fir are lynx habitat. Also, this table includes spruce/fir salvage which would only take place should a large epidemic of spruce beetles cause mass die off.

	Pike/San Isabel NF	Tennessee Creek Project Area	Tennessee Pass LAU	Massive LAU
Total Acres	**2,232,600**	**16,450**	**42,378**	**49,446**
Lynx Habitat	**897,306**	**9,480**	**19,953**	**22,114**
Treatable Acres	**-**	**13,580**	**6,640**	**6,940**
Clear Cut Acres	**-**	**2,485**	**1,158**	**1,327**
Thinning Acres	**-**	**7,110**	**3,300**	**3,810**

Ruggiero et al. (2000) states that areas of regenerating forest created by natural or anthropogenic sources can provide important hare habitat, but they are temporally transient. They suggested that forests managed for lynx should contain a mixture of age classes and structural conditions, the intent of the Tennessee Creek Project. Treating the area in a manner that would promote a diversity of age classes and structural conditions would reduce the likelihood that insects or diseases would impact the whole area at any one time, therefore promoting future diversity and heterogeneity as well as near-term biodiversity development. Areas of high biodiversity currently on the landscape would be retained as part of the "reserves" planned for the project. Thinning would be conducted in a mosaic fashion that would mimic natural disturbances.

Effects of Harvesting
CLEAR CUTS

Lodgepole pine tends to "prune" itself as it matures; meaning that the crown "lifts" and branches lower to ground level are not available as foraging for snowshoe hare. See photo 1 below. Areas that are climax lodgepole (lodgepole stands with a <5% of spruce/fire component) or mature monocultures of lodgepole pine are not considered lynx habitat. These are the areas within the Tennessee Creek project that will be targeted for clear-cut harvest and will not have an effect on snowshoe hare or lynx use

other than a slight beneficial increase in foraging habitat due to regenerating forests (in 15-20 years) should these stands be adjacent to lynx habitat.

Photo 1. Typical lodgepole pine stand that has "pruned" its low lying branches.

Clear cuts (up to 40 acres in size) would generally be located in areas that have marginal to poor horizontal cover for snowshoe hare. Areas in question of DHC levels will be measured by the wildlife biologist or other trained personnel. In areas where openings are created or augmented it is expected to take around 15-30 years before lodgepole pine regeneration provides winter foraging habitat for snowshoe hare, lynx primary food source. Treatment activities will open up the forest floor for increased production of grasses and forbs and eventually regeneration of trees. These clear cuts will be irregular in shape and will blend with features (like existing meadows) currently on the landscape. Emphasized areas would be those next to spruce/fir stands as well as adjacent to aspen stands to enhance the vigor and growth of those species. Forests that are growing back after fire or logging often provide excellent food and cover for hares, and therefore may attract lynx. This could increase or improve snowshoe hare winter forage habitat beginning in the next 2-3 decades or more as DHC develops in harvested areas, ultimately benefitting lynx in the mid-term.

The Tennessee Pass LAU and Massive LAU have 19,953 and 22,114 acres of lynx habitat on National Forest System lands. There are no acres of the above lynx habitat currently unsuitable due to past harvesting activities within the project area where trees have not yet regrown to heights where branches are available above mean snow levels for foraging snowshoe hare. Proposed activities would convert approximately 1,158 ac (6%) and 1,327 ac (6%) of lower quality lynx habitat (habitat with <35% DHC) within the Tennessee Pass and Massive LAUs to currently unsuitable for the next approximately 15-30 years where clear cuts are proposed. The timeline for implementation is stretched out over the next 10 years and treatment locations would be scattered throughout the entire project area. Meaning, all the clear cuts would not be implemented all in one location, all at the same time; rather scattered throughout the 16,450 acres over a 10 year time period. The Tennessee Pass and Massive LAUs would have approximately 6% of its lynx habitat in an unsuitable condition post project implementation. Converting the

above percent of lynx habitat to unsuitable is likely to have some short to mid-term (0-30 years) negative effects on lynx due the size, scope, and location of this project at the LAU scale. **Should a mass die off of spruce/fir occur due to beetles, the percentage of "currently unsuitable" habitat would need to be recalculated and new thresholds would be determined for implementation of this project.** It is estimated that approximately 1,100 acres total would be treated in a year and those acres would be a combination of clear cuts (250 acres) and/or thinnings (850 acres) on average spaced throughout the project area. However, as unsuitable habitat regenerates, it would provide a new cohort of regenerated forest habitats in an uneven-aged mosaic of older forests that would provide snowshoe hare foraging habitat in about 20-30 years following harvest. Foraging benefits overall (10 year implementation timeframe) could be realized 20-40 years from now and longer. Prescribed burning in some or all of the aspen treatment/promotion areas could very likely enhance the regeneration beyond cutting or clearing the small diameter trees alone.

The proposed harvesting treatments would likely result in less woody debris being available on the forest floor for both lynx denning opportunities and less structure for lynx prey. Denning habitat would take likely 150+ years to recover. According to the LCAS, red squirrel habitat is defined by coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally mature or older forests. This characteristic is often found in spruce/fir forests which will not be treated but can also be found in lodgepole pine forests. In Colorado, 66.4±5.6% of annual documented kills by lynx (n=604) were hares, varying annually from 30.4–90.8%, while an average of 22.6±5.7% were red squirrels (Shenk 2009). Harvesting mature, cone-producing conifer trees could reduce food available for red squirrels, causing them to expand their home ranges to satisfy nutritional needs. In areas targeted for clear cutting, red squirrel habitat would become unsuitable until the trees became of cone-producing age again, causing squirrels to move to adjacent suitable habitat. Targeted areas are located in non-lynx habitat or lower quality habitat (climax or seral lodgepole stands). Before the units regrow to ages suitable for red squirrels, the regenerating trees would provide excellent forage for snowshoe hares, the main prey species of lynx. Project design criteria (criteria number 3 listed above) requires retention of an average of at least 200 linear feet of the largest diameter wood available per acre and biologically important trees (squirrel middens) will remain intact. Some areas with closed canopy with substantial quantities of coarse woody debris will be incorporated into "reserve" areas between treatments and could be targeted around middens to protect squirrel habitat. All partially decomposed CWD will remain on site.

Table 8 below lists the amount of suitable lynx habitat pre- and post-project implementation (Alternative 1). Again, this is based on a hypothetical situation in which all treated acres are lynx habitat. This table displays the amount of clear cut acres that would temporarily change suitable habitat to "unsuitable" habitat until the regeneration has grown enough to be available to snowshoe hare above the level of the snow (approximately 15-30 years after treatment). The acres of thinning are not displayed in this table as those treatments wouldn't change a stand completely to "unsuitable" but may degrade it in quality in the short to mid- term (0-15 years). The long term (30+ years) effects of the un-even aged thinning treatments could promote quality lynx habitat in the encouragement of multi-storied diverse stands.

Table 8. Approximate acres of Canada lynx habitat present in the Tennessee Pass and Massive LAUs and proposed changes (Alternative 1) to lynx habitat. These acres would be converted to "currently unsuitable". (Source: PSICC common vegetation unit [CVU] database for National Forest lands

	Pike and San Isabel NF	Tennessee Creek Project Area	Tennessee Pass LAU	Tenn Pass LAU Post-treatment	% Change	Massive LAU	Massive LAU Post-treatment	% Change
Total Acres		**16,500**	**42,378**			**49,446**		
Lynx Habitat	**897,306**	**9,480**	**19,953**	**-1,160**	**6%**	**22,114**	**-1,330**	**6%**

There are 115 acres of clear cuts proposed in or surrounding aspen stands within the project area. Though aspen communities make up a small portion of the project area, they provide important habitat diversity and will be treated to improve the health and vigor of these stands. Ruediger et al. (2000) states that aspen may substantially contribute to prey productivity, while regenerating burns are often quite productive and the resulting conditions provide excellent habitat for snowshoe hare and other prey species.

Denning habitat would be lost or degraded, should it exist, in clear cut areas for 100+ years until a mature overstory develops and large woody material re-establishes at the site. Even though a design criterion above (criteria 3) requires appropriate amounts of downed logs or piles to remain on the landscape, it would not likely be enough to be considered quality denning habitat. Denning habitat usually consists of whole logs with attached root wads, jack-strawed logs, and boulders often found on north or east facing slopes. Mature spruce/fir stands are typical of providing higher quality denning habitat than lodgepole stands and would not be harvested under this proposed action (other than a possible salvage harvest and then 10% of the dead trees would remain for quality lynx denning habitat).

THINNING

Approximately 7,110 acres are proposed for thinning within the project area. Of this, 6,765 acres would consist of un-even aged management in which patch cutting (openings 5 acres or less) and single tree selection would promote age class and species diversity throughout the stands. Species that are not dominant (spruce/fir and aspen) would be retained to increase health and vigor of those species. Areas targeted for treatment include "transitional" areas, those areas where lodgepole stands and spruce/fir stands converge, or in seral lodgepole stands. This means that mature or young lodgepole will be harvested to encourage multi-story attributes and promote spruce/fir and aspen growth of remaining trees and regeneration.

Thinning designs are such that age class and species diversity are encouraged, it is done at variable levels throughout a stand, and is considered "un-even" age management (single tree and small group selection). In areas where thinning would be implemented, the lynx habitat may be temporarily degraded until young trees fill in, but would not be completely converted to "unsuitable". Many of these areas proposed for thinning are not likely higher quality lynx habitat to begin with and the thinning treatments may increase dense horizontal cover through regeneration of young trees in 15-30 years. The response of regeneration would depend on how much a stand would be opened up to allow more light to reach the forest floor. Stands that already have DHC (>35%), will be

retained as quality lynx habitat and would not receive treatment. Again, this would be determined by the wildlife biologist or other appropriately trained personnel if the DHC is not obviously more or less than 35%. Generally, the effects of thinning, depending on if the stand is thinned enough to allow regeneration, would increase foraging opportunities for snowshoe hare, and therefore lynx, as young trees fill in where the mature lodgepoles were removed.

Thinned areas could reduce the quality of red squirrel habitat by removing cone-producing trees, though the "un-even" age management style proposed provides for a variety of age and species classes. In thinning areas, design criteria require specified numbers of snags and coarse woody debris to remain on the landscape following treatment, both important in squirrel habitat. Middens would also be incorporated into reserve areas. Though the quality of foraging habitat for squirrels may be degraded in some thinned areas, there would remain sufficient amounts of cone-producing trees within and adjacent to treated areas to sustain squirrel populations.

Some precommercial thinning would take place in stands that were clear cut 20-30 years ago. The remaining 345 acres (out of the 7,110 proposed thinned acres) are proposed for this treatment throughout the project area. These stands are different from the rest of the proposal because they have been pre-identified on the landscape. From looking at the lynx habitat map (U.S. Forest Service 2013) in conjunction with the location of these old clear cuts, it can determined how many acres are in lynx habitat and how many are located in climax lodgepole stands. Within the Tennessee Pass LAU, there are 34 acres within lynx habitat that are proposed for precommercial thinning and within the Massive LAU there are approximately 31 acres within lynx habitat proposed for this treatment. These figures constitute 0.2% of lynx habitat in the Tennessee Pass LAU and 0.1% of lynx habitat within the Massive LAU that would be precommercially thinned which is consistent with Exception 5 of Standard VEG S5 of the SRLA (see Southern Rockies Lynx Amendment section below for further discussion). These stands would be thinned variably throughout with thinner areas (that could promote more regeneration within the stand and provide snowshoe hare foraging habitat longer as wide spacing of lodgepoles could delay "crown lift") coupled with portions left more dense. All stands within lynx habitat will be monitored prior to and after implementation to track snowshoe hare response. Depending on the degree of precommercial thinning, lynx winter foraging habitat could be improved (regeneration is increased and crown lift is delayed) or degraded (not enough trees are removed to promote regeneration thereby removing foraging habitat).

Incidental damage to snowshoe hare winter foraging habitat (due to mechanical trampling and ground disturbance of the seedling/sapling sized trees) from harvest/salvage activities would convert some treated areas into currently unsuitable lynx habitat for the next 15-30 years, though these acres would be included in the footprint of the treatment units and would not be additive beyond the acres already designated for treatment. Damage to any portion of lynx habitat that creates a measurable opening or conversion of lynx habitat from harvest equipment would be tracked and recorded as incidental damage and would count towards any limits imposed by the SRLA.

Larger clear cuts (up to 40 acres in size) and smaller patch cuts (generally 1-5 acres) would generally be located in areas that have marginal to poor horizontal cover for snowshoe hare. Thinning, salvaging, patch cutting, and removal of trees in some of the dense-canopied overstory stands of lynx habitat, primarily areas with very little understory vegetation, should improve the opportunities for developing an understory that provides snowshoe hare summer/winter foraging habitat (1-2 years for summer foraging; 15-30 years for winter foraging habitat) due to less competition for light, moisture, and nutrients.

OTHER ACTIONS

Salvage treatment will take place only in the event that spruce beetle or other insects and diseases impact spruce forests. Then, the following actions would be allowed: salvage of dead trees, removal of trees infested with beetles, and removal of green trees for skid trails, temporary roads or where trees will blow over. The project area includes approximately 1,215 acres of spruce of which up to 90% (1,094 acres) would be treated if necessary; the remaining 10% would be left for lynx denning habitat where appropriate. Spruce trees that are dead are not considered lynx habitat, and therefore removing them, would not count toward acre or percentage limitations set forth in the SRLA. The incidental damage caused by operations (skid trails, etc.) would be tracked appropriately for reporting requirements of the SRLA. Again, spruce/fir treatment will only take place in the event of die off of epidemic proportions. Currently there is no need or intent to treat any spruce/fir stands.

New temporary road construction and re-construction of old logging roads would turn approximately 21 miles (approximately 38 acres) of vegetated habitat possibly functioning as lynx habitat into unsuitable habitat. These 38 acres would be in addition to proposed clear cut acres, but would not substantially change percentages of lynx habitat converted over any LAU. Again, we are assuming all roads would be constructed in lynx habitat since the locations are not predetermined; though we know the actual acres converted will be less. All actual acres converted to "unsuitable" during implementation would be tracked and recorded as required by the SRLA. These temporary roads are not intended to remain open or be in use long-term. They would be rehabilitated and allowed to recover after implementation is complete. Depending on the method of closure (rip and seed vs. boulder and slash) the habitat may or may not return to pre-road construction levels, but would not be maintained permanently as non-habitat. Temporary roads could also lead to some new snow compaction and potential competition from carnivores should the public use them during the winter. Compiled information in the revised Lynx Conservation Assessment and Strategy (LCAS) regarding studies of coyote use on compacted snowmobile trails has yielded variable results. "It appears that snow column density and the number of freeze/thaw events in different regions may influence coyote movements and habitat selection (Burghardt-Dowd 2010). That is, snow penetrability in the region may determine whether or not snowmobile trails influence coyote movement patterns in lynx habitats (Bunnell 2006) (Kolbe 2007) (Burghardt-Dowd 2010))". Also "existing information suggests that some low level of competition for prey could occur naturally between lynx and coyotes. However, this is apt to vary spatially or temporally depending on overall prey availability and composition. Research that could conclusively demonstrate and quantify the effects of competition would be challenging due to numerous confounding factors." (Interagency Lynx Biology Team 2013). It is unknown as to whether or not the temporary roads will be used and compacted by the public facilitating competition

during the winter. It is unlikely as the appeal to snowmobile on a spur road for less than a mile is not typical in this area (district employee observations). Most snowmobilers travel on main routes (already on the compaction map) or to high elevation meadows and alpine play areas via these main routes. If temporary roads created by this project are used in the winter (by the public), it could have disturbance/displacement impacts, potentially facilitate competition by other carnivores, and contribute to a loss of habitat effectiveness should lynx be in the area. Again, temporary roads would be gated from public use, but during the winter, it could be difficult to prohibit use as snowmobiles are not restricted to roads.

Tree planting, which is proposed within the Ski Cooper boundary, would have a beneficial effect to snowshoe hare foraging habitat. Spruce and fir cones would be collected from local sources, germinated at a Forest Service nursery and would be available for use in establishing young islands of trees within existing runs. Planting spruce/fir trees that are already approximately one foot tall slightly shortens the time for an area to return to foraging snowshoe hare habitat on its own , estimated to be 30-40 years before they are above the average snowline and avaialble to hares in the winter as forage.

Prescribed fire- Prescribed burning is proposed on up to approximately 25-50% of thinned areas and may be used as a tool to create openings in other areas. Areas could be mechanically treated first and then burned. Burn areas would not be restricted to the areas mechanically treated but rather it could go beyond these boundaries or be used by a treatment itself. Burning in forested areas would reduce canopy cover and ground cover causing a reduction in snowshoe hare winter and/or summer foraging habitat in the short term (0-15 years). Conversely, fires often produce more snags on the landscape that eventually fall and become downed woody material that could provide additional denning habitat. Prescribed fire is a tool used to mimic natural ecological processes and would create a mosaic of biological diversity in the long-term (15+ years). Broadcast burning would not take place in spruce/fir stands or in sagebrush communities. Pile burning would be appropriate in these habitats if necessary to treat slash after a salvage treatment.

Disturbance/Displacement – Project related activities could cause some avoidance- or displacement-type of impacts to lynx in the event that lynx were in the area during project implementation activities due to smoke, prescribed fire, noise, personnel, road re-construction activities, project related vehicular traffic, and equipment operations. Disturbance from harvest activities, including cutting, skidding/yarding, and loading/hauling logs could result in displacing lynx from the general area in the short-term during project implementation periods for the life of the project (10 years total). Winter hauling could occur but would not result in increasing the amount of snow compaction in the LAU as all major identified haul roads are already currently being compacted by the public and are on the lynx snow compaction map (district files). Any winter skid trails associated with the major haul roads would be very small in overall compaction during any given winter and would be temporary in nature. Again, all temporary roads will be restricted (gates etc.) so that the public will not be able to access the area.

Harvest activities could occur intermittently year-round but primarily during the summer and fall with some pile burning in winter months, for up to 10 years. Prescribed burns generally take place in the fall and sometimes spring, depending on fuel conditions. Even though there is a possibility of disturbance/displacement effects from the project related activities, there is evidence that lynx are somewhat tolerant of humans (Ruediger 2000). It should also be noted that there are ***no seasonal restrictions*** on project related activities in ***any*** type of lynx habitat according to the LCAS (Ruediger et al. 2000). Several studies of lynx have been conducted in areas of relatively dense rural human populations and agricultural development, suggesting that lynx can tolerate moderate levels of human disturbance (Ruggiero, et al. 2000).

Other proposed actions- Numerous other actions have been proposed in Alternative one other than vegetation management. Replacing culverts to improve aquatic organism passageways, rehabilitating non-system routes and dispersed campsites, improving erosion and soil compaction issues at designated campgrounds, erecting a nesting platform at Turquoise Lake, and rehabilitating stream channel and functions would not have any measurable impacts to Canada lynx. These projects would improve riparian habitats and would not alter or remove any lynx habitat during implementation.

The snag creation would improve habitat for cavity dependent wildlife. These snags will eventually fall and become downed woody debris but would not likely create substantial amounts of downed logs typical of quality denning habitat, but may provide refuge for red squirrels, lynx secondary prey species. Substantial road maintenance that may be required to accommodate logging traffic on FSR 109 would have little, if any, impact to lynx or lynx habitat. Though there may be one acre of disturbance in the re-contouring of FSR 109, it is not within lynx habitat. The only effects to lynx from these proposals would be the temporary noise and sight disturbance in the immediate area caused by people, machinery, etc. Implementation for these projects is likely to be very short in duration (one day to several weeks) depending on the project. As mentioned above, lynx tend to be fairly tolerant of human activity and could easily disperse to adjacent areas.

Modification of lynx habitat from project activities that are designed to mimic natural patterns and scale, would likely provide for improved opportunities for lynx in the long-term (15-40+ years) as treatment types are consistent with those recommended in the SRLA and LCAS. Tree harvesting whether clear cutting, salvaging, burning or thinning could have some direct short-term (0-15 years) negative effects on lynx winter foraging habitat in each LAU due to a reduction in the amount of winter habitat post-project implementation. However, there likely would be a future (in 15-30 yrs.) increase in lynx winter foraging habitat in areas where clear cuts and patch cuts are created and the forest canopy is opened up. This would allow for increased quantities of grass, forbs, young trees and shrubs. Opening up the landscape with clear cuts and/or prescribed burning also increases habitat fragmentation, which degrades the effectiveness and quality of lynx habitat. "Direct habitat effects of fragmentation of most concern in lynx conservation are (1) reduction of area and patch size of late-successional forest and optimal snowshoe hare habitat; (2) creation of openings that facilitate access by potentially competing carnivores; (3) increased densities of edges between early successional and other forest types; and (4) changes in the amount and structural complexity of seral forest stands within landscapes." (Ruggiero, et al. 2000). The Tennessee Creek project could, through fragmentation, facilitate access by potentially

competing carnivores and increase densities of edges between early successional and other forest types. It is unknown as to whether or not the temporary roads will facilitate competition during the winter but it is unlikely as the appeal to snowmobile on a spur road for less than a mile is not typical in this area. Most snowmobilers travel on main routes (already on the compaction map) or to high elevation meadows and alpine areas via these main routes. Patch size of optimal snowshoe hare habitat (spruce/fir and stands with >35% DHC) would not be reduced because these areas are excluded from treatment. And the structural complexity of seral forest stands would actually be increased because of this project by cutting mature lodgepole pine to provide for species and age diversity on the landscape. The possible increased density of edges could degrade habitat quality for lynx in the areas targeted for clear-cutting. Again, lower quality lynx habitat and non-lynx habitat are targeted for this kind of treatment.

Because treatments are designed such that they are spread out over the 16,450 acres over the course of 10 years, it is unlikely movement throughout the LAU or linkage area would be hindered. All high quality lynx habitat (stands with DHC >35%) would be retained as important refuge and excluded from direct treatment. Much of the project area is directly adjacent to wilderness areas (the Holy Cross Wilderness near Tennessee Pass and Turquoise Lake and the Mt. Massive Wilderness near Halfmoon) that provide quality refuge next to, but away from the project area.

The SRLA consistently discusses the impacts that 2-4 lane **highways** have on lynx connectivity and linkage areas. *"Risk factors affecting lynx movement include barriers to movements such as **major highways** and associated development with rights-of-way. Private land development, especially along road corridors in mountain valleys, may also fragment habitat and impede movement of lynx. Urban expansion and development on private land has further fragmented an already patchy distribution of lynx habitat, many times in response to development or expansion of a developed recreational facility on NFS lands within lynx habitats."* (U. S. Forest Service 2008). Increased fragmentation and isolation has occurred due to cumulative impacts from highways and residential and recreational development often tied to ski areas developed on National Forest System lands (Hickenbottom 1999). Connectivity provided by linkage areas can be degraded or severed by human infrastructure such as high-use highways, subdivisions or other developments." (Ruediger 2000)

Vegetation management could also lead to compromised habitat connectivity depending on the nature of the treatments and juxtaposition to linkage areas. The SRLA does not provide a specified measure or amount to quantify adequate habitat connectivity. We assume that the risk factors (highways, private land developments, new ski areas etc.) listed by experts above are to be avoided in order to maintain connectivity. Though vegetation management from this project and the associated activities (temporary roads) would potentially degrade lynx habitat quality in the short term, it would not cause the impacts to the degree that new developments, highways or ski areas would. Temporary roads that would be constructed due to this project would receive extremely low traffic volume and speeds; would be typically less than 1 mile long; and would not lead to associated development. It would be extremely unlikely that lynx would avoid crossing or be killed on a single-lane, low traffic, low speed, dirt road. Per the ROD in the SRLA (U. S. Forest Service 2008), "Unlike high-speed highways, the types of roads managed by the Forest Service do not have the high speeds and high use levels that would create barriers to lynx movements or result in significant mortality risk." Project

design and design criteria mitigate the degradation of lynx habitat by concentrating treatments in lower quality habitat and improving the foraging capability of those.

Reserve areas would be left on the landscape as refuge for wildlife species. Reserve areas would be located throughout the project area and would consist of steep areas (greater than 35%), inaccessible areas, and wet areas. In mapped lynx habitat, stands with greater than 35% dense horizontal cover would also be retained and no spruce/fir stands would be treated. Lynx are tightly associated with spruce/fir stands. In addition to this, approximately 10 percent of the areas identified for thinning would be left as reserve areas. There would be at least 200 feet distance between adjacent clearcuts to provide secure travel corridors for wildlife. Thinning and prescribed fire treatments may occur within some of the corridors, while others would remain untreated. Old growth, areas with closed canopy or with substantial quantities of coarse woody debris would be targeted and incorporated into reserve areas between treatments and areas containing important wildlife habitat features such as squirrel middens. The high quality lynx habitat (spruce/fir stands and stands with >35% DHC) will not be treated. In those areas identified for treatment but also in mapped lynx habitat (seral lodgepole stands), the result will be a matrix of diversified forest with openings of various sizes, irregular thinning, un-even aged management, and reserves.

According to the SRLA, landscape connectivity may be provided by: (a) narrow forested mountain ridges and plateaus connecting more extensive mountain forest habitats, (b) wooded or willow riparian communities providing travel cover across open valley floors between mountain ranges, or (c) lower elevation ponderosa pine, pinyon-juniper woodlands or shrublands that separate high elevation spruce-fir forests. (U. S. Forest Service 2008). The Tennessee Pass linkage area was designated because it "provides major connections between blocks of habitat, tying the Sawatch Range to Summit County and into a habitat block near Vail Pass. It includes a portion of Fremont Pass and connects the Snake and Arkansas River drainages." Inside of this linkage area lays Ski Cooper and Highway 24, both entities that cause habitat fragmentation and degradation of connectivity. However, there is still nearly 3 miles of suitable habitat to the west of Highway 24 and the project boundary on Tennessee Pass still within the linkage area that would provide for the "narrow forested mountain ridge that connects extensive forest habitats" as stated above. Though the SRLA does not specify exactly what "narrow" means, it is assumed that a width of almost 3 miles of suitable habitat on the pass would be sufficient to accommodate traveling lynx between larger blocks of habitat. Riparian areas (also identified above as suitable for providing connectivity) would also be protected and buffered from treatments and would not change due to this project. The third suggestion above for providing connectivity (lower elevation ponderosa pine) does not apply to this project as there is not that habitat type available here.

Because this project (1) does not create new highways, ski areas, or new private land development (the three major things identified as hindering connectivity), (2) there is sufficient amounts of suitable habitat left on the landscape providing connectivity as suggested by the SRLA, (3) there are no treatments in high quality lynx habitat (spruce/fir and any stands with >35% DHC), and (4) treated areas (located in lower quality lynx habitat; seral lodgepole pine stands) provide a mosaic of gaps, dense areas, openings, thinned areas, and reserves; this project will maintain connectivity on the landscape as well as within the linkage area.

Interrelated and Interdependent Actions
There are no interrelated and interdependent actions related to this proposed action.

SOUTHERN ROCKIES LYNX AMENDMENT (SRLA)

Standards and Guides Applicable to Alternative 1 (Proposed Action)

The SRLA describes several objectives, standards, and guidelines intended to conserve lynx and to reduce or eliminate adverse effects from a spectrum of management activities on federal lands. These measures are provided to assist federal agencies in seeking opportunities to benefit lynx and to help avoid negative impacts. The PSICC as well as other National Forests in Region 2 have adopted the SRLA (Forest Service 2008) as a consistent and effective approach for lynx conservation. The following section below addresses SRLA compliance with the proposed action**.**

Objective VEG 01
Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.

Met. The project is designed to create more age classes and species diversity to break up the unnatural succession of a monoculture of lodgepole, created during the mining boom in the late 1880's and early 1900's. Lynx habitat has been identified and project design allows for retention of high quality habitat and enhancement of low-quality foraging areas.

Objective VEG 02
Provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.

Met. The Tennessee Creek project will preserve high quality snowshoe hare habitat (stands with >35% DHC) that currently exists. Low quality foraging habitat will be converted to the stand initiation structural stage while maintaining or enhancing adjacent areas with mature, multi-storied characteristics.

Objective VEG 04
Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.

Met. Areas consisting of climax lodgepole pine (little to no DHC or snowshoe hare habitat) will be targeted for clear-cutting activities. Other areas with low horizontal cover will also be targeted for treatment, either clear-cutting or thinning in an un-even age management style to promote multi-storied stands. Any stands with high (>35%) horizontal cover will be retained as quality snowshoe hare habitat and will not receive treatment.

Standard VEG 01

If more than 30% of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.

Met. Currently there are no acres of lynx habitat within the stand initiation stage, mapped as "currently unsuitable", in the Tennessee Pass and Massive LAUs respectively. Full implementation of The Tennessee Creek Project would put the percent of lynx habitat in the stand initiation stage in the Tennessee Pass LAU and the Massive LAUs at 6% for each. Should a large epidemic (insect and disease, blowdown, etc.) commence and put these LAUs over this 30% threshold, timber harvesting activities associated with this project that regenerate stands would cease and would not be implemented.

Standard VEG 02

Timber management projects shall not regenerate more than 15% of lynx habitat on NFS lands within and LAU in a ten-year period. This 15% includes the entire stand within an even-age regeneration area, and only the patch opening areas within group sections. Salvage harvest within stands killed by insect epidemics, wildfire, etc. does not add to the 15%, unless the harvest treatment would cause the lynx habitat to change to an unsuitable condition.

Met. The acres proposed for clear-cutting are at a maximum 1,158 and 1,327 acres for the Tennessee Pass LAU and the Massive LAU. This would put the percent of stands in initiation structural stage for each LAU at 6%. There are no stands currently in this state. Smaller patch cuts (up to 5 acres) within stands proposed for thinning would also count toward this threshold and would be recorded and tracked appropriately as such.

Standard VEG S5

Precommercial thinning practices and similar activities intended to reduce seedling/sapling density are subject to the following limitations from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat. Precommercial thinning may occur only (VEG S5 Exceptions): Exceptions 3 and 5 below only apply to this project:

3. For conifer removal in aspen, or daylight thinning, around individual aspen trees, where aspen is in decline

5. Precommercial thinning may occur provided that:

a. The additional precommercial thinning does not exceed 1% of the lynx habitat in any LAU for the life of this amendment, and the amount and distribution of winter snowshoe hare habitat within the LAU must be provided through appropriate site-specific analysis and consultation; and

b. Precommercial thinning in LAUs with more than 30% of the lynx habitat currently in the stand initiation structural stage is limited to areas that do not yet provide winter snowshoe hare habitat; and

c. Projects are designed to maintain lynx habitat connectivity and provide snowshoe hare habitat over the long term; and

d. Monitoring is used to determine snowshoe hare response.

Met. Only 345 acres total throughout the 16,450 acre project area are proposed for precommercial thinning, 40 acres in the Tennessee Pass LAU and 305 acres in the Massive LAU. However, many stands proposed for precommercial thinning in the

Massive LAU are not within lynx habitat and would not contribute to the 1% threshold. Only approximately 31 acres in the Massive LAU are in lynx habitat and all 34 acres in the Tennessee Pass LAU are in lynx habitat. This constitutes 0.1% and 0.2% of the lynx habitat in the Massive LAU and Tennessee Pass LAU. Neither LAU has more than 30% of lynx habitat currently in the stand initiation stage. In fact, no stands are in the stand initiation stage. The nature of implementation of the Tennessee Creek Project provides for snowshoe hare habitat over the long term as treatments are spread out on a landscape scale and will be implemented intermittently over the next 10 years. Reserve areas between clear cuts will provide covered travel corridors and higher quality stands for foraging (stands with >35% DHC) would also remain on the landscape providing foraging and movement areas. Thinning would be at variable levels throughout the stand creating mosaics of thinned and unthinned areas. Monitoring would take place prior to and following implementation to determine snowshoe hare response. Pellet plots in these stands could be used as a monitoring technique. (Note: The previously consulted on project "Leadville Timber Stand Improvement Project" in 2012 was never implemented and the acres for that project are included in this proposal.)

Standard VEG S6

Vegetation management projects that reduce winter snowshoe hare habitat in multi-story mature or late successional conifer forests may occur only (VEG S6 Exceptions): Exceptions 3 and 4 below are the only ones that apply to this project:

3. For incidental removal during salvage harvest (e.g., removal due to location of skid trails); or

4. Where uneven-aged management (single tree and small group selection) practices are employed to maintain and encourage multi-story attributes as part of gap dynamics. Project design must be consistent with VEG 01 and 02, except where impacts to areas of dense horizontal cover are incidental to activities under this exception (e.g., construction of ski trails).

Met. Salvage harvest will only be implemented should the need arise; currently the conditions on the landscape do not warrant salvage treatments, but this project is designed to allow for it should the need arise. The intent and design of this project is to create a diversity of age classes and species diversity on a landscape scale. Preference would be given to retaining other species (spruce, fir, aspen) over lodgepole pine and spacing would be variable. Trees would be thinned in a manner to create clumps or cohorts of trees intermingled with small, irregular openings or areas of lower tree density. Approximately 7,110 acres of the project area (16,450 acres) would be thinned in this manner. Prescribed fire would be used to create a mosaic of openings and variable densities of cover, mimicking natural disturbances. This uneven-aged management style is consistent with exemption 4 of this standard and acres are not limited under this standard.

Guideline VEG G1

Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat.

Met. The intent of this project is in line with this guideline as the goal of the Tennessee Creek Project is to create more age class diversity as well as species diversity

in a monoculture of mature lodgepole pine stands. Climax lodgepole stands will be targeted for treatments that regenerate young trees and spruce/fir/aspen will have preference over lodgepole in areas that are to be thinned, providing for the opportunity for increased horizontal cover and higher quality lynx habitat in the long-term (50+ yrs).

Guideline VEG G4

Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.

Met. Every effort would be made to prevent any temporary routes from becoming a regularly used route by the public. This would be accomplished by restricting the public from using any temporarily created roads by using boulders, gates, etc., or any other means necessary to restrict access. Roads would be permanently closed immediately after the final treatment is complete (sometimes there is a year or two between mechanical treatment completion and prescribed burning). The road would be closed appropriately and should not facilitate any addition to snow compaction.

Guideline VEG G5

Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.

Met. Design criteria numbers 2 and 3 provide for retainment of snags and coarse woody debris within treated stands. There will be reserve areas in which no treatments would take place, ensuring adequate mature trees and stands are available for red squirrels. These reserves would provide canopy cover and coarse woody debris for squirrels and middens and surrounding clumps would be retained as well.

Guideline VEG G11

Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either downed logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.

Met. In the event that a spruce/fir salvage harvest would be needed due to insect and disease, windthrow, etc., 10% (150 acres) of the total available spruce/fir in the project area would not be salvaged. These reserve areas would be identified by and coordinated with the wildlife biologist to ensure the best possible future denning habitat is retained (areas near high quality foraging habitat, stands on north or east aspects etc.). These retained trees would eventually fall and become lynx denning habitat. These preferably would be retained in 5 acre patches or more. If there is no need for spruce/fir salvage, the reserve areas would include areas of large piles of wood etc. if available on the landscape.

Guideline HU G9

If project level analysis determines that new roads adversely affect lynx, then public motorized use should be restricted. Upon project completion, these roads should be reclaimed or decommissioned, if not needed for other management objectives.

Met. The timber personnel have estimated that approximately 21 miles of temporary roads would be needed in order to access the harvest sites. As mentioned above, all access would be restricted to the public through appropriate means (gates etc.) and roads would be decommissioned or closed immediately following final treatment.

Roads will remain gated between implementation phases to allow for fuels to cure, burn windows to align, and final implementation to be complete before closing the temporary road.

Objective ALL O1
Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.

Met. Connectivity would be maintained in and between the Tennessee Pass and Massive LAUs and throughout the Tennessee Pass Linkage area. Implementation is designed to take place intermittently over the next 10 years with treatment spread throughout the entire project area. No one location would be impacted at one time to the scale and degree that would prohibit lynx movement on the landscape. Clear cut areas would be limited to 40 acre patches reserve areas would remain to ensure movement through the linkage area would not be compromised (see treatment example Map 3 above). Forested areas with high quality lynx habitat (multi-storied lodgepole/spruce/fir with >35% dense horizontal cover) would not be treated and would provide security and movement corridors. Because this project (1) does not create new highways, ski areas, or new private land development (the three major things identified as hindering connectivity), (2) there is sufficient amounts of suitable habitat left on the landscape providing connectivity as suggested by the SRLA, (3) there are no treatments in high quality lynx habitat (spruce/fir and any stands with >35% DHC), and (4) treated areas (located in lower quality lynx habitat; seral lodgepole pine stands) provide a mosaic of gaps, dense areas, openings, thinned areas, and reserves; this project will maintain connectivity on the landscape as well as within the linkage area.

Standard ALL S1
New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage areas.

Met. See Objective ALL O1 above.

The Tennessee Creek Project has been designed to improve lynx foraging habitat where horizontal cover is lacking, protects high quality lynx habitat stands, does not prohibit movement throughout the LAUs or linkage areas, and promotes biological diversity (age class and species diversity) by mimicking natural disturbance patterns. The proposed action is consistent with all SRLA conservation measures. The effects to Canada lynx would be minimal, insignificant (immeasurable and would not reach the level of take) and discountable (extremely unlikely to occur). Based on the above rationale Alternative 1 (Proposed Action) considered in the Tennessee Creek Project **"may affect, not likely to adversely affect"** Canada lynx.

Alternative 2 (Alternative Action)
This alternative would have similar effects to lynx habitat as those discussed in Alternative 1 (Proposed Action) above but with higher levels and degrees of effects. The biggest change would be that more acres would be clear cut (3,970 acres compared to 2,485 of Alternative 1) and less acres overall would be thinned (3,030 acres compared to 7,110 acres in Alternative 1). The overall acres of treatment would be less (approximately 2,595 acres less than Alternative 1). See Tables 9 and 10 below for a

comparison of the two alternatives. More aspen would be clear cut (180 acres compared to 115 acres of Alternative 1), promoting more regeneration within that type of habitat. The amounts of precommercial thinning, treatments in spruce/fir and all other actions listed above in Alternative 1 would remain the same and would have identical results/effects for this alternative. There would be more short-term (0-30 years) negative impacts to lynx habitat (most notably, snowshoe hare winter foraging habitat) because of the higher amounts of clear cuts though total acres overall (clear cutting plus thinning) would be much less. Lynx habitat would be more fragmented due to more openings throughout as approximately 9% and 10% of lynx habitat within the Tennessee Pass and Massive LAUs would be converted to "currently unsuitable" until the regeneration grows enough to be available above mean snow levels for snowshoe hare. However, there could also be *more beneficial* long term (50+ years) winter snowshoe hare foraging habitat opportunities from the increase in regeneration in areas of poorly developed DHC and otherwise marginal forage habitats.

Table 9. Acre treatment comparison for Alternative 1 and Alternative 2 for lodgepole pine and aspen. Spruce/fir salvage treatments should they be needed are the same for both alternatives.

	Alternative 1 (Proposed Action)	Alternative 2	Acre Difference
Total Acres Treated	9,595	7,000	-2,595
Acres Clear Cut	2,485	3,970	+1,485
Acres Thinned	7,110	3,030	-4,080

Table 10. Comparison of lynx habitat change to currently unsuitable for Alternative 1 and Alternative 2 per LAU.

	Pike and San Isabel NF	Tennessee Creek Project Area	Tennessee Pass LAU	Tenn Pass LAU Post-treatment	% Change	Massive LAU	Massive LAU Post-treatment	% Change
Total Acres		**16,450**				**49,500**		
Lynx Habitat Change Alternative 1		**9,480**	**19,953**	**-1,158**	**6%**	**22,114**	**-1,327**	**6%**
Lynx habitat change Alternative 2		**9,480**	**19,953**	**-1,850**	**9%**	**22,114**	**-2,120**	**10%**

Interrelated and Interdependent Actions
There would be no interrelated and interdependent actions for this alternative.

SOUTHERN ROCKIES LYNX AMENDMENT (SRLA)

Standards and Guides Applicable to Alternative 2
Please note: All standards and guides applicable to Alternative 1 (Objectives VEG 01, VEG 02, VEG 04 and ALL 01; Standards VEG S1, VEG S2, VEG S5, VEG S6 and ALL S1; and Guidelines VEG G1, VEG G4, VEG G5, VEG G11 and HU G9) also apply to Alternative 2 and are in compliance with SRLA with the same reasoning. The only differences are highlighted below and are attributed to acreage and percentage changes. Please see all standards and guides listed above for Alternative 1 for they all apply here as well.

Standard VEG 01

If more than 30% of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.

Met. Currently there are no acres of lynx habitat within the stand initiation stage, mapped as "currently unsuitable", in the Tennessee Pass and Massive LAUs respectively. Full implementation of The Tennessee Creek Project Alternative 2 would put the percent of lynx habitat in the stand initiation stage in the Tennessee Pass LAU and the Massive LAUs at 9% and 10% respectively. Should a large epidemic (insect and disease, blowdown, etc.) commence and put these LAUs over this 30% threshold, timber harvesting activities associated with this project that regenerate stands would cease.

Standard VEG 02

Timber management projects shall not regenerate more than 15% of lynx habitat on NFS lands within and LAU in a ten-year period. This 15% includes the entire stand within an even-age regeneration area, and only the patch opening areas within group sections. Salvage harvest within stands killed by insect epidemics,, wildfire, etc. does not add to the 15%, unless the harvest treatment would case the lynx habitat to change to an unsuitable condition.

Met. The acres proposed for clear-cutting are 1,850 acres and 2,120 acres for the Tennessee Pass LAU and the Massive LAU. This would put the percent of stands in initiation structural stage at 9% and 10% respectively. Smaller patch cuts (up to 5 acres) within stands proposed for thinning would also count toward this threshold and would be recorded and tracked appropriately as such.

Standard VEG S6

Vegetation management projects that reduce winter snowshoe hare habitat in multi-story mature or late successional conifer forests may occur only (VEG S6 Exceptions): Exceptions 3 and 4 below are the only ones that apply to this project:

3. For incidental removal during salvage harvest (e.g., removal due to location of skid trails); or

4. Where uneven-aged management (single tree and small group selection) practices are employed to maintain and encourage multi-story attributes as part of gap dynamics. Project design must be consistent with VEG 01 and 02, except where impacts to areas of dense horizontal cover are incidental to activities under this exception (e.g., construction of ski trails).

Met. Salvage harvest will only be implemented should the need arise; currently the conditions on the landscape do not warrant salvage treatments, but this project is designed to allow for it should the need arise. The intent and design of this project is to create a diversity of age classes and species diversity on a landscape scale. Preference would be given to retaining other species (spruce, fir, aspen) over lodgepole pine and spacing would be variable. Trees would be thinned in a manner to create clumps or cohorts of trees intermingled with small, irregular openings or areas of lower tree density. Approximately 3,030 acres of the project area (16,450 acres) would be thinned in this manner. Prescribed fire would be used to create a mosaic of openings and variable densities of cover, mimic natural disturbances. This uneven-aged management style is consistent with exemption 4 of this standard and acres are not limited under this standard.

Objective ALL O1

Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.

Met. Connectivity would be maintained in and between the Tennessee Pass and Massive LAUs and throughout the Tennessee Pass Linkage area. Implementation is designed to take place intermittently over the next 10 years with treatment spread throughout the entire project area. No one location would be impacted at one time to the scale and degree that would prohibit lynx movement on the landscape. Clear cut areas would be limited to 40 acre patches and reserve areas would ensure movement through the linkage area would not be compromised. Forested areas with high quality lynx habitat (multi-storied lodgepole/spruce/fir with >35% dense horizontal cover) would not be treated and would provide security and movement corridors. Because this project (1) does not create new highways, ski areas, or new private land development (the three major things identified as hindering connectivity), (2) there is sufficient amounts of suitable habitat left on the landscape providing connectivity as suggested by the SRLA, (3) there are no treatments in high quality lynx habitat (spruce/fir and any stands with >35% DHC), and (4) treated areas (located in lower quality lynx habitat; seral lodgepole pine stands) provide a mosaic of gaps, dense areas, openings, thinned areas, and reserves; this project will maintain connectivity on the landscape as well as within the linkage area.

Alternative 2 would have similar results as those described for Alternative 1 except to a higher degree of effects. There would be more openings created throughout the landscape, essentially providing fewer reserve areas for lynx. However, much less land would be treated overall as the acres treated would be about 4,000 acres less. Though the degree of effects would be higher because of more clear cuts, it is unlikely that the effects would reach the level of take. Therefore Alternative 2 **"may affect, not likely to adversely affect"** Canada lynx.

Cumulative Effects Specific to Canada Lynx for all Alternatives

See the discussion above in section *8.0 Environmental Baseline* and in *Threatened, Endangered, and Forest Service Sensitive Species of the San Isabel National Forest* (Wrigley et al. 2012) which can be found on file at the District office for additional discussion of the cumulative effects which is incorporated by reference here. Many non-federal activities on and off-Forest that have occurred in the past and are part of the baseline and are discussed in Section 8.0 above. Many however, are ongoing and are reasonably expected to continue to occur in the foreseeable future within the analysis area, and may continue to affect lynx in the future as well. Therefore, these activities and the resulting impacts are also considered as cumulative effects for lynx. Also under ESA, we are not to consider future federal actions in our cumulative effects analysis, rather only future state, tribal, or private activities that are reasonably certain to occur within the action area.

Specific cumulative effects from different activities have varying effects to lynx and their/prey habitats. Ruediger et al. (2000) discussed the following cumulative effects specific to lynx. *"The basis of cumulative effects analysis is that the combined number, type and juxtaposition of human activities and natural disturbances may have a significant effect, even though each individual action appears to have minimal effects. Assumptions include:*

1. *Lynx can persist in most situations with some level of human activity.*
2. *Human activities and alteration of habitat decrease habitat quality and lynx use of habitat, but the thresholds are not known.*
3. *Areas without high human activity levels are likely more favorable to lynx.*
4. *Habitat connectivity is important to lynx conservation".*

It appears likely that climate change may affect some specialized species like Canada lynx over the long term by altering the extent of deep snow habitats preferred by lynx. Kerr and Packer (1998) used the general circulation model (GCM) developed at the Goddard Institute of Space Sciences for the Intergovernmental Panel on Climate Change to predict future mammal diversity patterns in Canada. Based upon their analysis they predicted that at least 25 mammal species, including Canada lynx and other species addressed here, are limited by the Arctic Ocean in their ability to disperse northward and are likely to undergo significant losses of habitat (Kerr and Packer 1998). For example, features of the snow may also influence lynx interaction with snowshoe hare. Since the effects of climate change are occurring over relatively long periods, the effects on lynx over the short term (10-15 years) are less clear. More focused research is needed on the effect of climate change on specific threatened and endangered species such as the Canada lynx and other species, to more accurately predict specific effects of climate change in the Southern Rockies.

Of particular concern for lynx is that a substantial amount of public recreation currently occurs over the analysis area – not just in mapped designated snow compaction areas. The impacts from these activities to this species are increased considerably from this additive use. A substantial amount of winter public snowmobile use is taking place unrestricted over the entire District (outside of Wilderness Areas) as discussed above in the Environmental Baseline. For example, an average of approximately 75-90% of the overall recreation use on the District and between 50-90% of the winter recreation use is from public recreation activities. Snow compaction by the public in these areas and other areas on the District regularly occurs outside areas of the designated snow compaction areas (those areas mapped in 1999-2000). Public use during the winter is widespread over the District (depending on snow condition) and their use is currently not regulated by the Forest Service or restricted to designed snow compaction routes. This increases in orders of magnitude the impacts from snow compaction, noise disturbance, and numerous other impacts from these and other recreation activities as discussed above for lynx and their prey. In addition, nighttime use by the public further restricts foraging opportunities and movement of lynx within these areas. The impacts from these activities to this species are increased considerably from this additive use. Public uses are also expected to expand into other areas as snowmobile technologies improve performance, increasing their effects on lynx and their habitats and connectivity within and between LAUs and habitat blocks directly and indirectly as a cumulative effect. The effects of this general public winter and summer uses could be substantial in the future. Given the existing and anticipated annual increase use in public use, these recreation activities may further impact lynx movement during the daytime and hinder lynx movement during the evening. This would cause disturbance reducing the value of diurnal security areas, and potentially prohibit the establishment of natal den sites, as well as decrease the quality of some winter foraging habitat with some areas – particular in key high elevation forested mountain passes habitat areas.

Future non-motorized activities by the general public occur frequently in roadless,

remote backcountry locations (e.g., horseback, hiking, snowshoeing, skiing, etc.). Effects of these recreation activities vary and depend on the type of activity as well. Each of these activities have and will continue to incrementally further impact lynx directly, indirectly, and cumulatively through habitat loss, fragmentation, and loss of effectiveness through short and long-term disturbances.

The amount of recreation events occurring on city (Leadville), county (Lake), and private lands in the analysis area is increasing and this trend is expected to continue as recreation in the Upper Arkansas River Valley increases in the future. Frequent and intense recreation activity may influence the way lynx respond and use the surrounding environment, according to the LCAS (Ruediger et al. 2000). Events and services occurring on state, city, county, and private lands primarily occur in developed residential areas outside habitat for lynx. These activities typically occur on the periphery of LAUs overlapping the District, and are located away from large habitat blocks described above. They are outside wilderness and roadless areas on NFS lands where there is habitat for the lynx. Therefore, their influence on lynx is limited to impacts to nearby small, isolated, or peripheral stands of potential habitat and potential disturbance of lynx that may be traveling through the area. The increase in highway travel associated with recreation events can contribute an incremental increase in potential impact to lynx from road collisions, although many roads and highways that provide access to where these events are held are already above the daily threshold of traffic volumes identified in the LCAS that can negatively impact lynx (4,000 vehicles per day).

This action would add slightly and incrementally to the cumulative effects to this species. These cumulative effects include recreation (i.e., hiking, biking, camping, hunting, boating, and horse riding), road maintenance, vehicle traffic, and the ongoing Northwest Fuels project which is inside the project area. Previous activities include: access/roads, timber management, recreation, water development and mining related actions. The proposed action would add to these effects. See Section 8.2 and 9.1 above and Wrigley et al. (2012) for additional information for the effects of these activities.

9.2.2 North American Wolverine (*Gulo gulo*)

Please see *Threatened, Endangered, and Forest Service Sensitive Species on the Pike and San Isabel National Forests* (Wrigley 2012) for more discussion on the life history and distribution of wolverine. In North America, wolverines occur within a wide variety of alpine, boreal, and arctic habitats, including boreal forests, tundra, and western mountains throughout Alaska and Canada. The species range extends to high elevations of Colorado. Wolverines do not appear to specialize on specific vegetation or geological habitat aspects, but instead select areas that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season (Copeland 2010). Persistent, stable snow greater than 1.5 meters (m) (5 feet (ft.))deep appears to be a requirement for natal denning, because it provides security for offspring and buffers cold winter temperatures (U.S. Fish and Wildlife Service 2013). Information on wolverine abundance is not available; therefore estimating population trends cannot be done at this time though is believed that populations in the Southern Rocky Mountains are extremely low and are not sustainable at current levels (U.S. Fish and Wildlife Service 2013). These deep snow habitats persisting into the spring are found on

the Leadville Ranger district and at the extreme upper elevational limits of the Tennessee Creek project boundary.

Direct and Indirect Effects

No Action Alternative
Because climate change may have negative effects on suitable habitat for wolverine (less snowpack available for denning), the continuation of increased temperatures could affect the quality and quantity of wolverine habitat on the Leadville and Holy Cross Ranger Districts. In the southern portion of wolverine range in North America, wolverines are constrained by their need for cold conditions and persistent spring snow to using only the coldest available landscapes (Copeland 2010). Though climate change can be expected to have effects on wolverine habitat, the severity and probability cannot be certain. Importantly, spring snow cover, and the bioclimatic niche that it indicates, is likely to continue to be strongly impacted by global climate change (Mote 2005), threatening wolverine throughout their geographic distribution. Reductions in spring snow cover associated with climatic warming will likely reduce the extent of wolverine habitat, with an associated loss of connectivity (Copeland 2010).

The continuation of increased recreation into high elevation, alpine habitats may disturb wolverines where historic levels of human presence were previously low. Backcountry travel, both motorized and non-motorized, is becoming increasingly popular and recreationists are able to access virtually any terrain, including high alpine habitats, with improved performance of snowmobiles etc. Though much of what would be considered quality habitat on the Leadville and Eagle Ranger Districts is located in wilderness where snowmobile use is prohibited, there are still other alpine areas that are impacted by winter motorized and non-motorized recreation. Because of past and current recreational use in these high alpine habitats and the continuation of increased temperatures due to climate change, the no action alternative is "**not likely to jeopardize the continued existence**" of wolverine.

Interdependent and Interrelated Actions
There are no interdependent or interrelated actions associated with this proposal.

Alternative 1 (Proposed Action)
In addition to the effects listed above for the No Action alternative (essentially the environmental baseline), Alternative 1 could cause some anthropogenic disturbance during implementation should wolverine be in the area. However, it is extremely unlikely that upper elevations within the project area would be harvested during the winter or spring (denning season) and would therefore not have an impact on snowpack or wolverine denning in the area. Though there are areas within the project area that have persisting snowpack into May, these areas currently receive high recreational use (Ski Cooper) during the start of denning season and are unlikely to provide the solitude normally preferred by wolverines. Again, wolverines do not appear to specialize on specific vegetation or geological habitat aspects, but instead select areas that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season (Copeland et al. 2010, entire). Winter range for ungulates (food source for wolverine) would be improved in places by opening up the forest canopy and allowing more forage to grow. Timing restrictions for timber harvest activities in winter range are part of the design criteria (criteria 10, 11, 12, and 13 above) and would protect

wintering big game species. The proposed action would not contribute to loss of persistent snowpack nor would it cause a reduction in food source for wolverine. Based on this and ongoing climate change, Alternative 1 determination would "**not likely jeopardize the continued existence**" of wolverine.

Interrelated and Interdependent Actions
There would be no interrelated and interdependent actions for this alternative.

Alternative 2
The effects on wolverine from Alternative 2 actions would likely be extremely similar to those discussed above for Alternative one. The difference between the two alternatives is a change in the number of acres proposed for clear cutting and thinning. Alternative 2 still would not contribute to loss of persistent snowpack nor would it cause a reduction in food source for wolverine. Based on this and the discussions in the Environmental Baseline (Section 8.0), Alternative 2 determination would "**not likely jeopardize the continued existence**" of wolverine.

Interrelated and Interdependent Actions
There would be no interrelated and interdependent actions for this alternative.

Cumulative Effects Specific to North American Wolverine for All Alternatives
See the discussion above and in *Threatened, Endangered, and Forest Service Sensitive Species of the San Isabel National Forest* (Wrigley et al. 2012) which can be found on file at the District office for additional discussion of the cumulative effects which is incorporated by reference here. Also, see Section 9.1 above for additional discussion for general cumulative effects which are also applicable to wolverine. Many non-federal activities on and off-Forest that have occurred in the past and are part of the baseline and are discussed in Section 8.2 above. Many however, are ongoing and are reasonably expected to continue to occur in the foreseeable future within the analysis area, and may continue to affect wolverine in the future as well. Therefore, these activities and the resulting impacts are also considered as cumulative effects for wolverine. Also under ESA, we are not to consider future federal actions in our cumulative effects analysis, rather only future state, tribal, or private activities that are reasonably certain to occur within the action area. Of particular concern for wolverine as discussed above is the continuation of climate change.

10.0 EFFECTS DETERMINATIONS SUMMARY

For Canada lynx and wolverine, the direct and indirect effects, and cumulative effects of the proposed action have been added to the environmental baseline as stated previously. The rationale for the determinations is discussed in the *Effects to Evaluated Species* (Section 9.0). No proposed or designated critical habitat is present within the Analysis Area nor would it be affected.

Table 11. Effect determinations for species addressed.
NLAA= may affect, not likely to adversely affect; NLJE= not likely to jeopardize the continued existence

Common Name	Scientific Name	Status	No Action	Alternative 1 (Proposed Action)	Alternative 2
Canada lynx	*Lynx canadensis*	Threatened	NLAA	NLAA	NLAA
North American Wolverine	*Gulo gulo luscus*	Candidate	NLJE	NLJE	NLJE

11.0 MITIGATION MEASURES

No mitigation measures are necessary for this project due to project design criteria that would be implemented to reduce and/or eliminate unacceptable negative effects to species analyzed for in this document.

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